NavSoft's

2013

Nautical Almanac

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Formulae

Dip = 0.971 x $Ht^{½}$ Ht in feet

or

Dip = 1.758 x $Ht^{½}$ Ht in meters

Refraction = 0.96/ Tan(Alt) Altitude > 11°

Parallax = HP x Cos(Alt)

Cos(Zenith Distance) = Sin(Lat) x Sin(Dec) + Cos(Lat) x Cos(Dec) x Cos(LHA)

Tan(Azimuth) = Sin(LHA) / [Cos(Lat) x Tan(Dec) - Sin(Lat) x Cos(LHA)]

ABC Tables

A = Cos(Lat) x Tan(Dec)

B = Sin(Lat) x Cos(LHA)

C = Sin(LHA) / Tan(Azimuth)

or

Azimuth = Atan[C/ Sin(LHA)]

Increments

Sun = 15°/ hour

Moon = 14°.316666'/ hour

Aries = 15°.041666'/ hour

Horizontal Parallaxes and Semi-Diameters for 2013

	Sun	Venus		Mars		Jupiter	Saturn
	SD	HP	SD	HP	SD	SD	SD
Jan 1	16'.3	0'.09	0'.09	0'.07	0'.04	0'.37	0'.12
Jan	16'.3	0'.09	0'.09	0'.06	0'.03	0'.36	0'.12
Feb	16'.2	0'.09	0'.08	0'.06	0'.03	0'.32	0'.13
Mar	16'.1	0'.09	0'.08	0'.06	0'.03	0'.29	0'.14
Apr	15'.9	0'.09	0'.08	0'.06	0'.03	0'.27	0'.14
May	15'.8	0'.09	0'.08	0'.06	0'.03	0'.26	0'.14
Jun	15'.7	0'.09	0'.09	0'.06	0'.03	0'.25	0'.13
Jul	15'.7	0'.10	0'.10	0'.06	0'.03	0'.25	0'.13
Aug	15'.8	0'.12	0'.11	0'.06	0'.03	0'.26	0'.12
Sep	15'.9	0'.14	0'.14	0'.07	0'.04	0'.28	0'.12
Oct	16'.0	0'.18	0'.18	0'.07	0'.04	0'.31	0'.11
Nov	16'.2	0'.26	0'.25	0'.08	0'.04	0'.34	0'.11
Dec	16'.3	0'.41	0'.40	0'.10	0'.05	0'.36	0'.12
Dec 31	16'.3	0'.52	0'.50	0'.11	0'.06	0'.37	0'.12

15th day of each month unless stated

Sun's HP = 0'.15

HP for Jupiter and Saturn < 0'.05

This Almanac was compiled using AstroNav which will print pages for any dates between 9999BC and 9999AD. It also includes data for all visible bodies at less than the cost of a printed Nautical Almanac. Further details and a demonstration version can be found at navsoft.com/astronav.html

Supplementary tables, which do not change from year to year, are available at navsoft.com/downloads.html

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2013 January 1, 2, 3 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.7		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
Tuesday 1 00	100° 48'.7	201° 53'.4	22° 20'.7 S	153° 29'.8	20° 12'.5 S	34° 41'.7	20° 54'.3 N	242° 54'.4	12° 26'.9 S
01	115° 51'.1	216° 52'.5	21'.0	168° 30'.2	12'.0	49° 44'.5	54'.3	257° 56'.7	27'.0
02	130° 53'.6	231° 51'.6	21'.4	183° 30'.6	11'.5	64° 47'.2	54'.3	272° 59'.0	27'.0
03	145° 56'.0	246° 50'.7	21'.7	198° 31'.1	11'.1	79° 49'.9	54'.2	288° 01'.2	27'.1
04	160° 58'.5	261° 49'.8	22'.0	213° 31'.5	10'.6	94° 52'.6	54'.2	303° 03'.5	27'.1
05	176° 01'.0	276° 48'.9	22'.4	228° 32'.0	10'.1	109° 55'.3	54'.2	318° 05'.8	27'.2
06	191° 03'.4	291° 47'.9	22'.7	243° 32'.4	09'.6	124° 58'.0	54'.1	333° 08'.0	27'.2
07	206° 05'.9	306° 47'.0	23'.1	258° 32'.8	09'.1	140° 00'.7	54'.1	348° 10'.3	27'.3
08	221° 08'.4	321° 46'.1	23'.4	273° 33'.3	08'.7	155° 03'.5	54'.1	3° 12'.6	27'.3
09	236° 10'.8	336° 45'.2	23'.7	288° 33'.7	08'.2	170° 06'.2	54'.1	18° 14'.9	27'.4
10	251° 13'.3	351° 44'.3	24'.0	303° 34'.1	07'.7	185° 08'.9	54'.0	33° 17'.1	27'.5
11	266° 15'.8	6° 43'.4	24'.4	318° 34'.6	07'.2	200° 11'.6	54'.0	48° 19'.4	27'.5
12	281° 18'.2	21° 42'.5	22° 24'.7 S	333° 35'.0	20° 06'.7 S	215° 14'.3	20° 54'.0 N	63° 21'.7	12° 27'.6 S
13	296° 20'.7	36° 41'.6	25'.0	348° 35'.4	06'.2	230° 17'.0	53'.9	78° 24'.0	27'.6
14	311° 23'.2	51° 40'.7	25'.4	3° 35'.9	05'.8	245° 19'.7	53'.9	93° 26'.2	27'.7
15	326° 25'.6	66° 39'.8	25'.7	18° 36'.3	05'.3	260° 22'.4	53'.9	108° 28'.5	27'.7
16	341° 28'.1	81° 38'.9	26'.0	33° 36'.8	04'.8	275° 25'.1	53'.9	123° 30'.8	27'.8
17	356° 30'.5	96° 38'.0	26'.3	48° 37'.2	04'.3	290° 27'.9	53'.8	138° 33'.1	27'.8
18	11° 33'.0	111° 37'.1	26'.7	63° 37'.6	03'.8	305° 30'.6	53'.8	153° 35'.4	27'.9
19	26° 35'.5	126° 36'.2	27'.0	78° 38'.1	03'.3	320° 33'.3	53'.8	168° 37'.6	27'.9
20	41° 37'.9	141° 35'.3	27'.3	93° 38'.5	02'.9	335° 36'.0	53'.7	183° 39'.9	28'.0
21	56° 40'.4	156° 34'.4	27'.6	108° 38'.9	02'.4	350° 38'.7	53'.7	198° 42'.2	28'.0
22	71° 42'.9	171° 33'.5	27'.9	123° 39'.4	01'.9	5° 41'.4	53'.7	213° 44'.5	28'.1
23	86° 45'.3	186° 32'.6	28'.2	138° 39'.8	01'.4	20° 44'.1	53'.7	228° 46'.7	28'.1
Wednesday 2 00	101° 47'.8	201° 31'.7	22° 28'.6 S	153° 40'.3	20° 00'.9 S	35° 46'.8	20° 53'.6 N	243° 49'.0	12° 28'.2 S
01	116° 50'.3	216° 30'.7	28'.9	168° 40'.7	00'.4	50° 49'.5	53'.6	258° 51'.3	28'.2
02	131° 52'.7	231° 29'.8	29'.2	183° 41'.1	19° 59'.9 S	65° 52'.2	53'.6	273° 53'.6	28'.3
03	146° 55'.2	246° 28'.9	29'.5	198° 41'.6	59'.4	80° 54'.9	53'.6	288° 55'.8	28'.3
04	161° 57'.6	261° 28'.0	29'.8	213° 42'.0	59'.0	95° 57'.6	53'.5	303° 58'.1	28'.4
05	177° 00'.1	276° 27'.1	30'.1	228° 42'.5	58'.5	111° 00'.4	53'.5	319° 00'.4	28'.4
06	192° 02'.6	291° 26'.2	30'.4	243° 42'.9	58'.0	126° 03'.1	53'.5	334° 02'.7	28'.5
07	207° 05'.0	306° 25'.3	30'.7	258° 43'.3	57'.5	141° 05'.8	53'.4	349° 04'.9	28'.6
08	222° 07'.5	321° 24'.4	31'.0	273° 43'.8	57'.0	156° 08'.5	53'.4	4° 07'.2	28'.6
09	237° 10'.0	336° 23'.5	31'.3	288° 44'.2	56'.5	171° 11'.2	53'.4	19° 09'.5	28'.7
10	252° 12'.4	351° 22'.6	31'.6	303° 44'.7	56'.0	186° 13'.9	53'.4	34° 11'.8	28'.7
11	267° 14'.9	6° 21'.7	31'.9	318° 45'.1	55'.5	201° 16'.6	53'.3	49° 14'.1	28'.8
12	282° 17'.4	21° 20'.7	22° 32'.2 S	333° 45'.5	19° 55'.0 S	216° 19'.3	20° 53'.3 N	64° 16'.3	12° 28'.8 S
13	297° 19'.8	36° 19'.8	32'.5	348° 46'.0	54'.5	231° 22'.0	53'.3	79° 18'.6	28'.9
14	312° 22'.3	51° 18'.9	32'.8	3° 46'.4	54'.0	246° 24'.7	53'.2	94° 20'.9	28'.9
15	327° 24'.8	66° 18'.0	33'.1	18° 46'.9	53'.6	261° 27'.4	53'.2	109° 23'.2	29'.0
16	342° 27'.2	81° 17'.1	33'.4	33° 47'.3	53'.1	276° 30'.1	53'.2	124° 25'.4	29'.0
17	357° 29'.7	96° 16'.2	33'.7	48° 47'.7	52'.6	291° 32'.8	53'.2	139° 27'.7	29'.1
18	12° 32'.1	111° 15'.3	34'.0	63° 48'.2	52'.1	306° 35'.5	53'.1	154° 30'.0	29'.1
19	27° 34'.6	126° 14'.4	34'.3	78° 48'.6	51'.6	321° 38'.2	53'.1	169° 32'.3	29'.2
20	42° 37'.1	141° 13'.4	34'.6	93° 49'.1	51'.1	336° 40'.9	53'.1	184° 34'.6	29'.2
21	57° 39'.5	156° 12'.5	34'.9	108° 49'.5	50'.6	351° 43'.6	53'.1	199° 36'.8	29'.3
22	72° 42'.0	171° 11'.6	35'.2	123° 50'.0	50'.1	6° 46'.3	53'.0	214° 39'.1	29'.3
23	87° 44'.5	186° 10'.7	35'.5	138° 50'.4	49'.6	21° 49'.0	53'.0	229° 41'.4	29'.4
Thursday 3 00	102° 46'.9	201° 09'.8	22° 35'.8 S	153° 50'.8	19° 49'.1 S	36° 51'.7	20° 53'.0 N	244° 43'.7	12° 29'.4 S
01	117° 49'.4	216° 08'.9	36'.0	168° 51'.3	48'.6	51° 54'.4	52'.9	259° 46'.0	29'.5
02	132° 51'.9	231° 08'.0	36'.3	183° 51'.7	48'.1	66° 57'.1	52'.9	274° 48'.2	29'.5
03	147° 54'.3	246° 07'.0	36'.6	198° 52'.2	47'.6	81° 59'.8	52'.9	289° 50'.5	29'.6
04	162° 56'.8	261° 06'.1	36'.9	213° 52'.6	47'.1	97° 02'.5	52'.9	304° 52'.8	29'.6
05	177° 59'.2	276° 05'.2	37'.2	228° 53'.1	46'.6	112° 05'.2	52'.8	319° 55'.1	29'.7
06	193° 01'.7	291° 04'.3	37'.4	243° 53'.5	46'.1	127° 07'.9	52'.8	334° 57'.4	29'.7
07	208° 04'.2	306° 03'.4	37'.7	258° 53'.9	45'.6	142° 10'.6	52'.8	349° 59'.6	29'.8
08	223° 06'.6	321° 02'.5	38'.0	273° 54'.4	45'.1	157° 13'.3	52'.8	5° 01'.9	29'.8
09	238° 09'.1	336° 01'.6	38'.3	288° 54'.8	44'.6	172° 16'.0	52'.7	20° 04'.2	29'.9
10	253° 11'.6	351° 00'.6	38'.6	303° 55'.3	44'.1	187° 18'.7	52'.7	35° 06'.5	29'.9
11	268° 14'.0	5° 59'.7	38'.8	318° 55'.7	43'.6	202° 21'.4	52'.7	50° 08'.8	30'.0
12	283° 16'.5	20° 58'.8	22° 39'.1 S	333° 56'.2	19° 43'.1 S	217° 24'.1	20° 52'.7 N	65° 11'.0	12° 30'.0 S
13	298° 19'.0	35° 57'.9	39'.4	348° 56'.6	42'.6	232° 26'.8	52'.6	80° 13'.3	30'.1
14	313° 21'.4	50° 57'.0	39'.6	3° 57'.1	42'.1	247° 29'.5	52'.6	95° 15'.6	30'.1
15	328° 23'.9	65° 56'.1	39'.9	18° 57'.5	41'.6	262° 32'.2	52'.6	110° 17'.9	30'.2
16	343° 26'.4	80° 55'.1	40'.2	33° 57'.9	41'.1	277° 34'.9	52'.5	125° 20'.2	30'.2
17	358° 28'.8	95° 54'.2	40'.4	48° 58'.4	40'.6	292° 37'.6	52'.5	140° 22'.5	30'.3
18	13° 31'.3	110° 53'.3	40'.7	63° 58'.8	40'.1	307° 40'.3	52'.5	155° 24'.7	30'.3
19	28° 33'.7	125° 52'.4	41'.0	78° 59'.3	39'.6	322° 43'.0	52'.5	170° 27'.0	30'.4
20	43° 36'.2	140° 51'.5	41'.2	93° 59'.7	39'.1	337° 45'.7	52'.4	185° 29'.3	30'.4
21	58° 38'.7	155° 50'.5	41'.5	109° 00'.2	38'.6	352° 48'.4	52'.4	200° 31'.6	30'.5
22	73° 41'.1	170° 49'.6	41'.8	124° 00'.6	38'.1	7° 51'.1	52'.4	215° 33'.9	30'.5
23	88° 43'.6	185° 48'.7	42'.0	139° 01'.1	37'.6	22° 53'.8	52'.4	230° 36'.1	30'.6
	M.P. 17:10	v -0'.9	d 0'.3	v 0'.4	d 0'.5	v 2'.7	d 0'.0	v 2'.3	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 18'.3	40° 15'.4 S
Achernar	335° 26'.9	57° 10'.5 S
Acrux	173° 09'.5	63° 10'.1 S
Adhara	255° 12'.4	28° 59'.6 S
Aldebaran	290° 49'.4	16° 32'.0 N
Alioth	166° 21'.0	55° 53'.0 N
Alkaid	152° 59'.3	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.9 S
Alnilam	275° 46'.3	1° 11'.8 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.5	26° 40'.2 N
Alpheratz	357° 43'.8	29° 10'.0 N
Altair	62° 08'.9	8° 54'.3 N
Ankaa	353° 16'.1	42° 14'.3 S
Antares	112° 26'.9	26° 27'.5 S
Arcturus	145° 56'.1	19° 06'.8 N
Atria	107° 29'.5	69° 02'.8 S
Avior	234° 17'.5	59° 33'.1 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.7	52° 42'.3 S
Capella	280° 34'.4	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.9 N
Denebola	182° 33'.9	14° 29'.7 N
Diphda	348° 56'.2	17° 55'.0 S
Dubhe	193° 51'.8	61° 40'.4 N
Elnath	278° 12'.6	28° 37'.0 N
Eltanin	90° 46'.8	51° 29'.3 N
Enif	33° 47'.6	9° 56'.3 N
Fomalhaut	15° 24'.5	29° 33'.2 S
Gacrux	172° 01'.1	57° 11'.0 S
Gienah	175° 52'.5	17° 36'.9 S
Hadar	148° 48'.5	60° 25'.9 S
Hamal	328° 00'.9	23° 31'.5 N
Kaus Aust.	83° 44'.6	34° 22'.5 S
Kochab	137° 20'.7	74° 05'.8 N
Markab	13° 38'.8	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.4 N
Menkent	148° 08'.0	36° 25'.9 S
Miaplacidus	221° 38'.9	69° 46'.2 S
Mirfak	308° 40'.4	49° 54'.6 N
Nunki	75° 59'.1	26° 16'.7 S
Peacock	53° 20'.3	56° 41'.5 S
Polaris	317° 39'.5	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 07'.1	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.4 S
Rigil Kent	139° 52'.4	60° 53'.0 S
Sabik	102° 13'.2	15° 44'.3 S
Schedar	349° 40'.8	56° 36'.9 N
Shaula	96° 22'.7	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.2 S
Spica	158° 31'.6	11° 13'.7 S
Suhail	222° 52'.3	43° 29'.2 S
Vega	80° 39'.6	38° 47'.9 N
Zuben'ubi	137° 05'.9	16° 05'.7 S
	SHA	Mer.Pass.
Venus	99° 43'.9	10:35
Mars	51° 52'.5	13:45
Jupiter	293° 59'.0	21:33
Saturn	142° 01'.2	07:44

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
179° 08'.3	23° 00'.1 S	319° 18'.2	13'.4	9° 42'.5 N	10'.0	55'.5
194° 08'.1	22° 59'.9 S	333° 50'.6	13'.5	32'.5	10'.0	
209° 07'.8	59'.7	348° 23'.1	13'.5	22'.5	10'.1	55'.6
224° 07'.5	59'.5	2° 55'.6	13'.5	12'.4	10'.1	
239° 07'.2	59'.3	17° 28'.1	13'.5	02'.3	10'.2	
254° 06'.9	59'.1	32° 00'.6	13'.5	8° 52'.1 N	10'.2	
269° 06'.6	58'.9	46° 33'.1	13'.5	41'.9	10'.2	
284° 06'.3	58'.7	61° 05'.6	13'.5	31'.7	10'.3	55'.7
299° 06'.0	58'.5	75° 38'.1	13'.5	21'.4	10'.4	
314° 05'.7	58'.3	90° 10'.6	13'.6	11'.0	10'.4	
329° 05'.4	58'.1	104° 43'.2	13'.5	00'.6	10'.4	
344° 05'.1	57'.8	119° 15'.7	13'.5	7° 50'.2 N	10'.5	55'.8
359° 04'.8	22° 57'.6 S	133° 48'.2	13'.6	7° 39'.7 N	10'.5	55'.8
14° 04'.5	57'.4	148° 20'.8	13'.5	29'.2	10'.5	
29° 04'.2	57'.2	162° 53'.3	13'.6	18'.7	10'.6	
44° 03'.9	57'.0	177° 25'.9	13'.6	08'.1	10'.7	
59° 03'.7	56'.8	191° 58'.5	13'.5	6° 57'.4 N	10'.7	55'.9
74° 03'.4	56'.6	206° 31'.0	13'.6	46'.7	10'.7	
89° 03'.1	56'.3	221° 03'.6	13'.5	36'.0	10'.7	
104° 02'.8	56'.1	235° 36'.1	13'.6	25'.3	10'.8	
119° 02'.5	55'.9	250° 08'.7	13'.6	14'.5	10'.8	
134° 02'.2	55'.7	264° 41'.3	13'.5	03'.7	10'.9	56'.0
149° 01'.9	55'.4	279° 13'.8	13'.6	5° 52'.8 N	10'.9	
164° 01'.6	55'.2	293° 46'.4	13'.5	41'.9	10'.9	
179° 01'.3	22° 55'.0 S	308° 18'.9	13'.6	5° 31'.0 N	10'.9	56'.0
194° 01'.0	54'.8	322° 51'.5	13'.5	20'.1	11'.0	56'.1
209° 00'.7	54'.6	337° 24'.0	13'.6	09'.1	11'.0	
224° 00'.5	54'.3	351° 56'.6	13'.5	4° 58'.1 N	11'.1	
239° 00'.2	54'.1	6° 29'.1	13'.5	47'.0	11'.1	
253° 59'.9	53'.9	21° 01'.6	13'.5	35'.9	11'.1	56'.2
268° 59'.6	53'.6	35° 34'.1	13'.6	24'.8	11'.1	
283° 59'.3	53'.4	50° 06'.7	13'.5	13'.7	11'.2	
298° 59'.0	53'.2	64° 39'.2	13'.5	02'.5	11'.2	
313° 58'.7	53'.0	79° 11'.7	13'.4	3° 51'.3 N	11'.2	
328° 58'.4	52'.7	93° 44'.1	13'.5	40'.1	11'.2	56'.3
343° 58'.1	52'.5	108° 16'.6	13'.5	28'.9	11'.3	
358° 57'.8	22° 52'.3 S	122° 49'.1	13'.4	3° 17'.6 N	11'.3	56'.3
13° 57'.6	52'.0	137° 21'.5	13'.5	06'.3	11'.3	
28° 57'.3	51'.8	151° 54'.0	13'.4	2° 55'.0 N	11'.3	56'.4
43° 57'.0	51'.6	166° 26'.4	13'.4	43'.7	11'.4	
58° 56'.7	51'.3	180° 58'.8	13'.4	32'.3	11'.4	
73° 56'.4	51'.1	195° 31'.2	13'.4	20'.9	11'.4	
88° 56'.1	50'.8	210° 03'.6	13'.3	09'.5	11'.4	56'.5
103° 55'.8	50'.6	224° 35'.9	13'.4	1° 58'.1 N	11'.4	
118° 55'.5	50'.4	239° 08'.3	13'.3	46'.7	11'.5	
133° 55'.2	50'.1	253° 40'.6	13'.3	35'.2	11'.4	
148° 55'.0	49'.9	268° 12'.9	13'.3	23'.8	11'.5	56'.6
163° 54'.7	49'.6	282° 45'.2	13'.2	12'.3	11'.5	
178° 54'.4	22° 49'.4 S	297° 17'.4	13'.3	1° 00'.8 N	11'.5	56'.6
193° 54'.1	49'.2	311° 49'.7	13'.2	0° 49'.3 N	11'.6	56'.7
208° 53'.8	48'.9	326° 21'.9	13'.2	37'.7	11'.5	
223° 53'.5	48'.7	340° 54'.1	13'.1	26'.2	11'.6	
238° 53'.2	48'.4	355° 26'.2	13'.2	14'.6	11'.5	
253° 52'.9	48'.2	9° 58'.4	13'.1	03'.1	11'.6	56'.8
268° 52'.7	47'.9	24° 30'.5	13'.1	0° 08'.5 S	11'.6	
283° 52'.4	47'.7	39° 02'.6	13'.0	20'.1	11'.6	
298° 52'.1	47'.4	53° 34'.6	13'.1	31'.7	11'.6	
313° 51'.8	47'.2	68° 06'.7	13'.0	43'.3	11'.6	56'.9
328° 51'.5	46'.9	82° 38'.7	12'.9	54'.9	11'.6	
343° 51'.2	46'.7	97° 10'.6	13'.0	1° 06'.5 S	11'.6	
358° 50'.9	22° 46'.4 S	111° 42'.6	12'.9	1° 18'.1 S	11'.6	56'.9
13° 50'.7	46'.2	126° 14'.5	12'.8	29'.7	11'.7	57'.0
28° 50'.4	45'.9	140° 46'.3	12'.9	41'.4	11'.6	
43° 50'.1	45'.7	155° 18'.2	12'.8	53'.0	11'.6	
58° 49'.8	45'.4	169° 50'.0	12'.7	2° 04'.6 S	11'.7	57'.1
73° 49'.5	45'.2	184° 21'.7	12'.8	16'.3	11'.6	
88° 49'.2	44'.9	198° 53'.5	12'.6	27'.9	11'.6	
103° 49'.0	44'.6	213° 25'.1	12'.7	39'.5	11'.6	
118° 48'.7	44'.4	227° 56'.8	12'.6	51'.1	11'.7	57'.2
133° 48'.4	44'.1	242° 28'.4	12'.6	3° 02'.8 S	11'.6	
148° 48'.1	43'.9	257° 00'.0	12'.5	14'.4	11'.6	
163° 47'.8	43'.6	271° 31'.5	12'.5	26'.0	11'.6	57'.3
SD 16'.3	d 0'.2	SD	15'.2	15'.3	15'.5	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3
N 72°	08:23	10:39	-	20:02	21:51	23:41
N 70°	08:04	09:48	-	20:12	21:53	23:36
68°	07:49	09:16	-	20:19	21:54	23:31
66°	07:37	08:52	10:26	20:25	21:55	23:28
64°	07:26	08:33	09:48	20:30	21:57	23:25
62°	07:17	08:18	09:22	20:35	21:58	23:22
60°	07:09	08:05	09:02	20:39	21:58	23:20
N 58°	07:02	07:54	08:45	20:42	21:59	23:18
56°	06:55	07:44	08:31	20:45	22:00	23:16
54°	06:50	07:35	08:19	20:48	22:00	23:14
52°	06:44	07:27	08:08	20:50	22:01	23:13
50°	06:39	07:20	07:58	20:53	22:01	23:12
45°	06:28	07:05	07:38	20:57	22:02	23:09
N 40°	06:18	06:52	07:22	21:01	22:03	23:06
35°	06:09	06:40	07:08	21:05	22:04	23:04
30°	06:00	06:30	06:56	21:08	22:05	23:03
20°	05:44	06:12	06:36	21:13	22:06	22:59
N 10°	05:28	05:55	06:17	21:18	22:07	22:57
0°	05:12	05:38	06:00	21:22	22:08	22:54
S 10°	04:53	05:20	05:43	21:27	22:09	22:52
20°	04:31	05:00	05:25	21:31	22:10	22:49
30°	04:03	04:36	05:03	21:37	22:11	22:46
35°	03:45	04:21	04:51	21:40	22:12	22:45
40°	03:22	04:03	04:36	21:43	22:13	22:43
45°	02:52	03:41	04:18	21:47	22:14	22:41
S 50°	02:09	03:13	03:56	21:52	22:15	22:38
52°	01:43	02:58	03:46	21:54	22:15	22:37
54°	01:04	02:41	03:34	21:56	22:16	22:35
56°	-	02:20	03:20	21:59	22:16	22:34
58°	-	01:52	03:04	22:02	22:17	22:33
S 60°	-	01:10	02:45	22:05	22:18	22:31
S 62°	-	-	02:20	22:09	22:19	22:29

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 1	Moonset 2	Moonset 3
N 72°	-	13:30	15:46	10:42	10:29	10:16
N 70°	-	14:21	16:05	10:31	10:24	10:18
68°	-	14:53	16:20	10:21	10:20	10:19
66°	13:43	15:17	16:32	10:14	10:17	10:20
64°	14:20	15:35	16:42	10:07	10:14	10:21
62°	14:47	15:50	16:52	10:02	10:12	10:22
60°	15:07	16:03	17:00	09:57	10:10	10:22
N 58°	15:24	16:15	17:07	09:52	10:08	10:23
56°	15:38	16:24	17:13	09:48	10:06	10:23
54°	15:50	16:33	17:19	09:45	10:05	10:24
52°	16:01	16:41	17:24	09:42	10:03	10:24
50°	16:10	16:48	17:29	09:39	10:02	10:25
45°	16:30	17:04	17:41	09:32	09:59	10:26
N 40°	16:46	17:17	17:51	09:27	09:57	10:26
35°	17:00	17:28	18:00	09:22	09:55	10:27
30°	17:12	17:38	18:08	09:18	09:53	10:27
20°	17:33	17:57	18:24	09:11	09:50	10:28
N 10°	17:51	18:14	18:40	09:05	09:47	10:29
0°	18:08	18:30	18:56	08:59	09:44	10:30
S 10°	18:25	18:48	19:15	08:53	09:41	10:31
20°	18:43	19:08	19:37	08:46	09:38	10:31
30°	19:05	19:32	20:05	08:39	09:35	10:32
35°	19:18	19:47	20:23	08:35	09:33	10:33
40°	19:32	20:05	20:46	08:30	09:31	10:33
45°	19:50	20:27	21:15	08:24	09:28	10:34
S 50°	20:11	20:55	21:58	08:17	09:25	10:35
52°	20:22	21:10	22:24	08:14	09:24	10:35
54°	20:34	21:27	23:02	08:11	09:22	10:35
56°	20:47	21:47	-	08:07	09:20	10:36
58°	21:03	22:15	-	08:02	09:19	10:36
S 60°	21:22	22:56	-	07:57	09:16	10:37
S 62°	21:47	-	-	07:52	09:14	10:37

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
1	3 26	3 40	12:04	02:48	15:11	19d 85%
2	3 54	4 08	12:04	03:33	15:56	20d 77%
3	4 22	4 36	12:05	04:19	16:42	21d 68%

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2013 January 4, 5, 6 (Fri, Sat, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.7		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
4 Friday 00	103° 46'.1	200° 47'.8	22° 42'.3 S	154° 01'.5	19° 37'.1 S	37° 56'.5	20° 52'.3 N	245° 38'.4	12° 30'.6 S
01	118° 48'.5	215° 46'.9	42'.5	169° 02'.0	36'.6	52° 59'.1	52'.3	260° 40'.7	30'.7
02	133° 51'.0	230° 45'.9	42'.8	184° 02'.4	36'.1	68° 01'.8	52'.3	275° 43'.0	30'.7
03	148° 53'.5	245° 45'.0	43'.0	199° 02'.9	35'.6	83° 04'.5	52'.3	290° 45'.3	30'.8
04	163° 55'.9	260° 44'.1	43'.3	214° 03'.3	35'.0	98° 07'.2	52'.2	305° 47'.6	30'.8
05	178° 58'.4	275° 43'.2	43'.5	229° 03'.7	34'.5	113° 09'.9	52'.2	320° 49'.8	30'.9
06	194° 00'.9	290° 42'.3	43'.8	244° 04'.2	34'.0	128° 12'.6	52'.2	335° 52'.1	30'.9
07	209° 03'.3	305° 41'.3	44'.0	259° 04'.6	33'.5	143° 15'.3	52'.2	350° 54'.4	31'.0
08	224° 05'.8	320° 40'.4	44'.3	274° 05'.1	33'.0	158° 18'.0	52'.1	5° 56'.7	31'.0
09	239° 08'.2	335° 39'.5	44'.5	289° 05'.5	32'.5	173° 20'.7	52'.1	20° 59'.0	31'.1
10	254° 10'.7	350° 38'.6	44'.8	304° 06'.0	32'.0	188° 23'.4	52'.1	36° 01'.3	31'.1
11	269° 13'.2	5° 37'.6	45'.0	319° 06'.4	31'.5	203° 26'.1	52'.1	51° 03'.5	31'.2
12	284° 15'.6	20° 36'.7	22° 45'.3 S	334° 06'.9	19° 31'.0 S	218° 28'.8	20° 52'.0 N	66° 05'.8	12° 31'.2 S
13	299° 18'.1	35° 35'.8	45'.5	349° 07'.3	30'.5	233° 31'.4	52'.0	81° 08'.1	31'.3
14	314° 20'.6	50° 34'.9	45'.8	4° 07'.8	30'.0	248° 34'.1	52'.0	96° 10'.4	31'.3
15	329° 23'.0	65° 34'.0	46'.0	19° 08'.2	29'.4	263° 36'.8	52'.0	111° 12'.7	31'.4
16	344° 25'.5	80° 33'.0	46'.2	34° 08'.7	28'.9	278° 39'.5	51'.9	126° 15'.0	31'.4
17	359° 28'.0	95° 32'.1	46'.5	49° 09'.1	28'.4	293° 42'.2	51'.9	141° 17'.3	31'.5
18	14° 30'.4	110° 31'.2	46'.7	64° 09'.6	27'.9	308° 44'.9	51'.9	156° 19'.5	31'.5
19	29° 32'.9	125° 30'.3	46'.9	79° 10'.0	27'.4	323° 47'.6	51'.9	171° 21'.8	31'.6
20	44° 35'.3	140° 29'.3	47'.2	94° 10'.5	26'.9	338° 50'.3	51'.8	186° 24'.1	31'.6
21	59° 37'.8	155° 28'.4	47'.4	109° 10'.9	26'.4	353° 52'.9	51'.8	201° 26'.4	31'.7
22	74° 40'.3	170° 27'.5	47'.6	124° 11'.4	25'.9	8° 55'.6	51'.8	216° 28'.7	31'.7
23	89° 42'.7	185° 26'.6	47'.9	139° 11'.8	25'.3	23° 58'.3	51'.7	231° 31'.0	31'.8
5 Saturday 00	104° 45'.2	200° 25'.6	22° 48'.1 S	154° 12'.3	19° 24'.8 S	39° 01'.0	20° 51'.7 N	246° 33'.3	12° 31'.8 S
01	119° 47'.7	215° 24'.7	48'.3	169° 12'.7	24'.3	54° 03'.7	51'.7	261° 35'.5	31'.9
02	134° 50'.1	230° 23'.8	48'.6	184° 13'.2	23'.8	69° 06'.4	51'.7	276° 37'.8	31'.9
03	149° 52'.6	245° 22'.9	48'.8	199° 13'.6	23'.3	84° 09'.1	51'.7	291° 40'.1	32'.0
04	164° 55'.1	260° 21'.9	49'.0	214° 14'.1	22'.8	99° 11'.7	51'.6	306° 42'.4	32'.0
05	179° 57'.5	275° 21'.0	49'.2	229° 14'.5	22'.3	114° 14'.4	51'.6	321° 44'.7	32'.1
06	195° 00'.0	290° 20'.1	49'.5	244° 15'.0	21'.7	129° 17'.1	51'.6	336° 47'.0	32'.1
07	210° 02'.5	305° 19'.2	49'.7	259° 15'.4	21'.2	144° 19'.8	51'.6	351° 49'.3	32'.2
08	225° 04'.9	320° 18'.2	49'.9	274° 15'.9	20'.7	159° 22'.5	51'.5	6° 51'.5	32'.2
09	240° 07'.4	335° 17'.3	50'.1	289° 16'.3	20'.2	174° 25'.2	51'.5	21° 53'.8	32'.2
10	255° 09'.8	350° 16'.4	50'.3	304° 16'.8	19'.7	189° 27'.8	51'.5	36° 56'.1	32'.3
11	270° 12'.3	5° 15'.4	50'.5	319° 17'.3	19'.1	204° 30'.5	51'.5	51° 58'.4	32'.3
12	285° 14'.8	20° 14'.5	22° 50'.8 S	334° 17'.7	19° 18'.6 S	219° 33'.2	20° 51'.4 N	67° 00'.7	12° 32'.4 S
13	300° 17'.2	35° 13'.6	51'.0	349° 18'.2	18'.1	234° 35'.9	51'.4	82° 03'.0	32'.4
14	315° 19'.7	50° 12'.7	51'.2	4° 18'.6	17'.6	249° 38'.6	51'.4	97° 05'.3	32'.5
15	330° 22'.2	65° 11'.7	51'.4	19° 19'.1	17'.1	264° 41'.3	51'.4	112° 07'.6	32'.5
16	345° 24'.6	80° 10'.8	51'.6	34° 19'.5	16'.6	279° 43'.9	51'.3	127° 09'.8	32'.6
17	0° 27'.1	95° 09'.9	51'.8	49° 20'.0	16'.0	294° 46'.6	51'.3	142° 12'.1	32'.6
18	15° 29'.6	110° 08'.9	52'.0	64° 20'.4	15'.5	309° 49'.3	51'.3	157° 14'.4	32'.7
19	30° 32'.0	125° 08'.0	52'.2	79° 20'.9	15'.0	324° 52'.0	51'.3	172° 16'.7	32'.7
20	45° 34'.5	140° 07'.1	52'.4	94° 21'.3	14'.5	339° 54'.7	51'.2	187° 19'.0	32'.8
21	60° 37'.0	155° 06'.2	52'.6	109° 21'.8	13'.9	354° 57'.3	51'.2	202° 21'.3	32'.8
22	75° 39'.4	170° 05'.2	52'.8	124° 22'.2	13'.4	10° 00'.0	51'.2	217° 23'.6	32'.9
23	90° 41'.9	185° 04'.3	53'.0	139° 22'.7	12'.9	25° 02'.7	51'.2	232° 25'.9	32'.9
6 Sunday 00	105° 44'.3	200° 03'.4	22° 53'.2 S	154° 23'.2	19° 12'.4 S	40° 05'.4	20° 51'.1 N	247° 28'.2	12° 33'.0 S
01	120° 46'.8	215° 02'.4	53'.4	169° 23'.6	11'.9	55° 08'.1	51'.1	262° 30'.4	33'.0
02	135° 49'.3	230° 01'.5	53'.6	184° 24'.1	11'.3	70° 10'.7	51'.1	277° 32'.7	33'.1
03	150° 51'.7	245° 00'.6	53'.8	199° 24'.5	10'.8	85° 13'.4	51'.1	292° 35'.0	33'.1
04	165° 54'.2	259° 59'.7	54'.0	214° 25'.0	10'.3	100° 16'.1	51'.0	307° 37'.3	33'.2
05	180° 56'.7	274° 58'.7	54'.2	229° 25'.4	09'.8	115° 18'.8	51'.0	322° 39'.6	33'.2
06	195° 59'.1	289° 57'.8	54'.4	244° 25'.9	09'.2	130° 21'.4	51'.0	337° 41'.9	33'.2
07	211° 01'.6	304° 56'.9	54'.6	259° 26'.3	08'.7	145° 24'.1	51'.0	352° 44'.2	33'.3
08	226° 04'.1	319° 55'.9	54'.8	274° 26'.8	08'.2	160° 26'.8	51'.0	7° 46'.5	33'.3
09	241° 06'.5	334° 55'.0	55'.0	289° 27'.3	07'.7	175° 29'.5	50'.9	22° 48'.8	33'.4
10	256° 09'.0	349° 54'.1	55'.2	304° 27'.7	07'.1	190° 32'.1	50'.9	37° 51'.1	33'.4
11	271° 11'.4	4° 53'.1	55'.4	319° 28'.2	06'.6	205° 34'.8	50'.9	52° 53'.3	33'.5
12	286° 13'.9	19° 52'.2	22° 55'.6 S	334° 28'.6	19° 06'.1 S	220° 37'.5	20° 50'.9 N	67° 55'.6	12° 33'.5 S
13	301° 16'.4	34° 51'.3	55'.7	349° 29'.1	05'.5	235° 40'.2	50'.8	82° 57'.9	33'.6
14	316° 18'.8	49° 50'.3	55'.9	4° 29'.5	05'.0	250° 42'.8	50'.8	98° 00'.2	33'.6
15	331° 21'.3	64° 49'.4	56'.1	19° 30'.0	04'.5	265° 45'.5	50'.8	113° 02'.5	33'.7
16	346° 23'.8	79° 48'.5	56'.3	34° 30'.5	04'.0	280° 48'.2	50'.8	128° 04'.8	33'.7
17	1° 26'.2	94° 47'.5	56'.5	49° 30'.9	03'.4	295° 50'.9	50'.7	143° 07'.1	33'.8
18	16° 28'.7	109° 46'.6	56'.6	64° 31'.4	02'.9	310° 53'.5	50'.7	158° 09'.4	33'.8
19	31° 31'.2	124° 45'.7	56'.8	79° 31'.8	02'.4	325° 56'.2	50'.7	173° 11'.7	33'.9
20	46° 33'.6	139° 44'.7	57'.0	94° 32'.3	01'.8	340° 58'.9	50'.7	188° 14'.0	33'.9
21	61° 36'.1	154° 43'.8	57'.2	109° 32'.7	01'.3	356° 01'.5	50'.7	203° 16'.3	33'.9
22	76° 38'.6	169° 42'.9	57'.4	124° 33'.2	00'.8	11° 04'.2	50'.6	218° 18'.6	34'.0
23	91° 41'.0	184° 41'.9	57'.5	139° 33'.7	00'.2	26° 06'.9	50'.6	233° 20'.8	34'.0
	M.P. 16:58	v -0'.9	d 0'.2	v 0'.5	d 0'.5	v 2'.7	d 0'.0	v 2'.3	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.3	40° 15'.4 S
Achernar	335° 26'.9	57° 10'.5 S
Acrux	173° 09'.5	63° 10'.1 S
Adhara	255° 12'.4	28° 59'.6 S
Aldebaran	290° 49'.4	16° 32'.0 N
Alioth	166° 21'.0	55° 53'.0 N
Alkaid	152° 59'.3	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.9 S
Alnilam	275° 46'.3	1° 11'.8 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.5	26° 40'.2 N
Alpheratz	357° 43'.9	29° 10'.0 N
Altair	62° 08'.9	8° 54'.3 N
Ankaa	353° 16'.1	42° 14'.3 S
Antares	112° 26'.9	26° 27'.5 S
Arcturus	145° 56'.1	19° 06'.7 N
Atria	107° 29'.5	69° 02'.8 S
Avior	234° 17'.5	59° 33'.1 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.7	52° 42'.4 S
Capella	280° 34'.4	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.9 N
Denebola	182° 33'.9	14° 29'.7 N
Diphda	348° 56'.2	17° 55'.0 S
Dubhe	193° 51'.8	61° 40'.4 N
Elnath	278° 12'.6	28° 37'.0 N
Eltanin	90° 46'.8	51° 29'.3 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.5	29° 33'.2 S
Gacrux	172° 01'.1	57° 11'.0 S
Gienah	175° 52'.5	17° 36'.9 S
Hadar	148° 48'.5	60° 25'.9 S
Hamal	328° 01'.0	23° 31'.5 N
Kaus Aust.	83° 44'.6	34° 22'.5 S
Kochab	137° 20'.7	74° 05'.8 N
Markab	13° 38'.8	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.4 N
Menkent	148° 08'.0	36° 25'.9 S
Miaplacidus	221° 38'.9	69° 46'.2 S
Mirfak	308° 40'.4	49° 54'.6 N
Nunki	75° 59'.1	26° 16'.7 S
Peacock	53° 20'.3	56° 41'.5 S
Polaris	317° 40'.6	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 07'.1	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.4 S
Rigil Kent	139° 52'.3	60° 53'.0 S
Sabik	102° 13'.2	15° 44'.3 S
Schedar	349° 40'.8	56° 36'.9 N
Shaula	96° 22'.7	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.2 S
Spica	158° 31'.6	11° 13'.8 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.6	38° 47'.9 N
Zuben'ubi	137° 05'.9	16° 05'.7 S
	SHA	Mer.Pass.
Venus	95° 40'.4	10:39
Mars	49° 27'.1	13:43
Jupiter	294° 15'.8	21:20
Saturn	141° 48'.0	07:33

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 47'.5	22° 43'.3 S	286° 03'.0	12'.4	3° 37'.6 S	11'.6	57'.3
193° 47'.2	43'.1	300° 34'.4	12'.4	49'.2	11'.6	
208° 47'.0	42'.8	315° 05'.8	12'.4	4° 00'.8 S	11'.6	
223° 46'.7	42'.6	329° 37'.2	12'.3	12'.4	11'.6	57'.4
238° 46'.4	42'.3	344° 08'.5	12'.3	24'.0	11'.6	
253° 46'.1	42'.0	358° 39'.8	12'.2	35'.6	11'.5	
268° 45'.8	41'.8	13° 11'.0	12'.1	47'.1	11'.6	57'.5
283° 45'.6	41'.5	27° 42'.1	12'.1	58'.7	11'.5	
298° 45'.3	41'.2	42° 13'.2	12'.1	5° 10'.2 S	11'.5	
313° 45'.0	41'.0	56° 44'.3	12'.0	21'.7	11'.5	57'.6
328° 44'.7	40'.7	71° 15'.3	12'.0	33'.2	11'.5	
343° 44'.4	40'.4	85° 46'.3	11'.9	44'.7	11'.5	
358° 44'.1	22° 40'.1 S	100° 17'.2	11'.8	5° 56'.2 S	11'.4	57'.6
13° 43'.9	39'.9	114° 48'.0	11'.8	6° 07'.6 S	11'.5	57'.7
28° 43'.6	39'.6	129° 18'.8	11'.8	19'.1	11'.4	
43° 43'.3	39'.3	143° 49'.6	11'.7	30'.5	11'.4	
58° 43'.0	39'.0	158° 20'.3	11'.6	41'.9	11'.3	57'.8
73° 42'.7	38'.8	172° 50'.9	11'.6	53'.2	11'.4	
88° 42'.5	38'.5	187° 21'.5	11'.5	7° 04'.6 S	11'.3	
103° 42'.2	38'.2	201° 52'.0	11'.4	15'.9	11'.3	57'.9
118° 41'.9	37'.9	216° 22'.4	11'.4	27'.2	11'.3	
133° 41'.6	37'.7	230° 52'.8	11'.3	38'.5	11'.2	
148° 41'.3	37'.4	245° 23'.1	11'.3	49'.7	11'.2	
163° 41'.1	37'.1	259° 53'.4	11'.2	8° 00'.9 S	11'.2	58'.0
178° 40'.8	22° 36'.8 S	274° 23'.6	11'.1	8° 12'.1 S	11'.1	58'.0
193° 40'.5	36'.5	288° 53'.7	11'.1	23'.2	11'.2	
208° 40'.2	36'.3	303° 23'.8	11'.0	34'.4	11'.0	58'.1
223° 39'.9	36'.0	317° 53'.8	11'.0	45'.4	11'.1	
238° 39'.7	35'.7	332° 23'.8	10'.8	56'.5	11'.0	
253° 39'.4	35'.4	346° 53'.6	10'.8	9° 07'.5 S	11'.0	58'.2
268° 39'.1	35'.1	1° 23'.4	10'.8	18'.5	10'.9	
283° 38'.8	34'.8	15° 53'.2	10'.6	29'.4	10'.9	
298° 38'.5	34'.6	30° 22'.8	10'.6	40'.3	10'.9	58'.3
313° 38'.3	34'.3	44° 52'.4	10'.5	51'.2	10'.8	
328° 38'.0	34'.0	59° 21'.9	10'.5	10° 02'.0 S	10'.8	
343° 37'.7	33'.7	73° 51'.4	10'.4	12'.8	10'.7	
358° 37'.4	22° 33'.4 S	88° 20'.8	10'.3	10° 23'.5 S	10'.7	58'.4
13° 37'.2	33'.1	102° 50'.1	10'.2	34'.2	10'.6	
28° 36'.9	32'.8	117° 19'.3	10'.2	44'.8	10'.6	
43° 36'.6	32'.5	131° 48'.5	10'.0	55'.4	10'.6	58'.5
58° 36'.3	32'.2	146° 17'.5	10'.0	11° 06'.0 S	10'.5	
73° 36'.1	31'.9	160° 46'.5	10'.0	16'.5	10'.4	
88° 35'.8	31'.7	175° 15'.5	9'.8	26'.9	10'.4	58'.6
103° 35'.5	31'.4	189° 44'.3	9'.8	37'.3	10'.4	
118° 35'.2	31'.1	204° 13'.1	9'.7	47'.7	10'.2	
133° 35'.0	30'.8	218° 41'.8	9'.6	57'.9	10'.3	58'.7
148° 34'.7	30'.5	233° 10'.4	9'.5	12° 08'.2 S	10'.1	
163° 34'.4	30'.2	247° 38'.9	9'.4	18'.3	10'.1	
178° 34'.1	22° 29'.9 S	262° 07'.3	9'.4	12° 28'.4 S	10'.1	58'.8
193° 33'.9	29'.6	276° 35'.7	9'.3	38'.5	10'.0	
208° 33'.6	29'.3	291° 04'.0	9'.2	48'.5	9'.9	
223° 33'.3	29'.0	305° 32'.2	9'.1	58'.4	9'.9	
238° 33'.0	28'.7	320° 00'.3	9'.1	13° 08'.3 S	9'.8	58'.9
253° 32'.8	28'.4	334° 28'.4	8'.9	18'.1	9'.7	
268° 32'.5	28'.1	348° 56'.3	8'.9	27'.8	9'.7	
283° 32'.2	27'.8	3° 24'.2	8'.8	37'.5	9'.6	59'.0
298° 31'.9	27'.5	17° 52'.0	8'.7	47'.1	9'.5	
313° 31'.7	27'.1	32° 19'.7	8'.6	56'.6	9'.4	
328° 31'.4	26'.8	46° 47'.3	8'.5	14° 06'.0 S	9'.4	59'.1
343° 31'.1	26'.5	61° 14'.8	8'.4	15'.4	9'.3	
358° 30'.8	22° 26'.2 S	75° 42'.2	8'.4	14° 24'.7 S	9'.2	59'.1
13° 30'.6	25'.9	90° 09'.6	8'.3	33'.9	9'.2	59'.2
28° 30'.3	25'.6	104° 36'.9	8'.2	43'.1	9'.1	
43° 30'.0	25'.3	119° 04'.1	8'.0	52'.2	8'.9	
58° 29'.8	25'.0	133° 31'.1	8'.1	15° 01'.1 S	9'.0	
73° 29'.5	24'.7	147° 58'.2	7'.9	10'.1	8'.8	59'.3
88° 29'.2	24'.4	162° 25'.1	7'.8	18'.9	8'.7	
103° 28'.9	24'.0	176° 51'.9	7'.8	27'.6	8'.7	
118° 28'.7	23'.7	191° 18'.7	7'.6	36'.3	8'.5	59'.4
133° 28'.4	23'.4	205° 45'.3	7'.6	44'.8	8'.5	
148° 28'.1	23'.1	220° 11'.9	7'.5	53'.3	8'.4	
163° 27'.9	22'.8	234° 38'.4	7'.4	16° 01'.7 S	8'.3	59'.5
SD 16'.3	d 0'.3	SD	15'.7	15'.9	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6
N 72°	08:19	10:29	-	-	01:37	03:45
N 70°	08:01	09:42	-	-	01:23	03:19
68°	07:47	09:12	11:27	-	01:12	02:59
66°	07:35	08:49	10:19	-	01:03	02:43
64°	07:25	08:31	09:44	-	00:56	02:30
62°	07:16	08:16	09:19	-	00:49	02:20
60°	07:08	08:04	08:59	-	00:44	02:10
N 58°	07:01	07:53	08:43	-	00:39	02:02
56°	06:55	07:43	08:30	-	00:35	01:55
54°	06:49	07:35	08:18	-	00:31	01:49
52°	06:44	07:27	08:07	-	00:27	01:44
50°	06:39	07:20	07:58	-	00:24	01:39
45°	06:28	07:05	07:38	-	00:17	01:28
N 40°	06:18	06:52	07:22	-	00:11	01:19
35°	06:09	06:41	07:09	-	00:07	01:11
30°	06:01	06:31	06:57	-	00:02	01:04
20°	05:45	06:12	06:36	23:55	-	00:53
N 10°	05:30	05:56	06:19	23:48	-	00:43
0°	05:13	05:39	06:02	23:42	-	00:33
S 10°	04:55	05:22	05:45	23:36	-	00:24
20°	04:33	05:02	05:27	23:30	-	00:14
30°	04:05	04:38	05:05	23:23	-	00:03
35°	03:47	04:24	04:53	23:19	23:57	24:39
40°	03:25	04:06	04:39	23:14	23:49	24:29
45°	02:56	03:45	04:21	23:09	23:41	24:18
S 50°	02:14	03:16	04:00	23:03	23:31	24:04
52°	01:49	03:02	03:50	23:00	23:26	23:58
54°	01:13	02:45	03:38	22:57	23:21	23:51
56°	-	02:25	03:25	22:53	23:15	23:43
58°	-	01:59	03:09	22:49	23:09	23:34
S 60°	-	01:20	02:50	22:45	23:02	23:24
S 62°	-	-	02:26	22:40	22:54	23:12

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 4	Moonset 5	Moonset 6
N 72°	-	13:43	15:52	10:03	09:48	09:28
N 70°	-	14:29	16:10	10:11	10:04	09:56
68°	12:44	15:00	16:25	10:18	10:17	10:17
66°	13:52	15:22	16:37	10:23	10:27	10:34
64°	14:27	15:40	16:47	10:28	10:36	10:48
62°	14:52	15:55	16:56	10:32	10:44	10:59
60°	15:12	16:08	17:03	10:35	10:51	11:09
N 58°	15:28	16:18	17:10	10:39	10:56	11:18
56°	15:42	16:28	17:17	10:41	11:02	11:26
54°	15:54	16:37	17:22	10:44	11:06	11:33
52°	16:04	16:44	17:28	10:46	11:10	11:39
50°	16:13	16:51	17:32	10:48	11:14	11:44
45°	16:33	17:07	17:43	10:53	11:23	11:57
N 40°	16:49	17:19	17:53	10:57	11:30	12:07
35°	17:03	17:31	18:02	11:00	11:36	12:15
30°	17:14	17:41	18:10	11:03	11:41	12:23
20°	17:35	17:59	18:26	11:08	11:50	12:36
N 10°	17:52	18:15	18:41	11:13	11:59	12:48
0°	18:09	18:32	18:58	11:17	12:06	12:59
S 10°	18:26	18:49	19:16	11:21	12:14	13:10
20°	18:44	19:09	19:38	11:26	12:22	13:21
30°	19:05	19:33	20:05	11:31	12:32	13:35
35°	19:18	19:47	20:23	11:34	12:37	13:42
40°	19:32	20:04	20:45	11:37	12:43	13:51
45°	19:49	20:26	21:14	11:41	12:50	14:02
S 50°	20:11	20:54	21:56	11:46	12:59	14:14
52°	20:21	21:08	22:20	11:48	13:03	14:20
54°	20:32	21:25	22:55	11:50	13:08	14:27
56°	20:46	21:45	-	11:53	13:12	14:34
58°	21:01	22:11	-	11:56	13:18	14:42
S 60°	21:20	22:49	-	11:59	13:24	14:51
S 62°	21:43	-	-	12:03	13:31	15:02

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
4	4 49	5 03	12:05	05:06	17:30	22d 57%
5	5 16	5 30	12:05	05:54	18:20	23d 46%
6	5 43	5 56	12:06	06:46	19:13	24d 35%

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2013 January 7, 8, 9 (Mon, Tue, Wed)

GMT		ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.7		SATURN +0.7	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
7 Monday	00	106° 43'.5	199° 41'.0	22° 57'.7 S	154° 34'.1	18° 59'.7 S	41° 09'.6	20° 50'.6 N	248° 23'.1	12° 34'.1 S
	01	121° 45'.9	214° 40'.1	57'.9	169° 34'.6	59'.2	56° 12'.2	50'.6	263° 25'.4	34'.1
	02	136° 48'.4	229° 39'.1	58'.0	184° 35'.0	58'.6	71° 14'.9	50'.5	278° 27'.7	34'.2
	03	151° 50'.9	244° 38'.2	58'.2	199° 35'.5	58'.1	86° 17'.6	50'.5	293° 30'.0	34'.2
	04	166° 53'.3	259° 37'.3	58'.4	214° 36'.0	57'.6	101° 20'.2	50'.5	308° 32'.3	34'.3
	05	181° 55'.8	274° 36'.3	58'.5	229° 36'.4	57'.0	116° 22'.9	50'.5	323° 34'.6	34'.3
	06	196° 58'.3	289° 35'.4	58'.7	244° 36'.9	56'.5	131° 25'.6	50'.4	338° 36'.9	34'.4
	07	212° 00'.7	304° 34'.5	58'.9	259° 37'.3	56'.0	146° 28'.2	50'.4	353° 39'.2	34'.4
	08	227° 03'.2	319° 33'.5	59'.0	274° 37'.8	55'.4	161° 30'.9	50'.4	8° 41'.5	34'.5
	09	242° 05'.7	334° 32'.6	59'.2	289° 38'.3	54'.9	176° 33'.6	50'.4	23° 43'.8	34'.5
	10	257° 08'.1	349° 31'.7	59'.3	304° 38'.7	54'.4	191° 36'.2	50'.4	38° 46'.1	34'.5
	11	272° 10'.6	4° 30'.7	59'.5	319° 39'.2	53'.8	206° 38'.9	50'.3	53° 48'.4	34'.6
	12	287° 13'.1	19° 29'.8	22° 59'.7 S	334° 39'.6	18° 53'.3 S	221° 41'.6	20° 50'.3 N	68° 50'.7	12° 34'.6 S
	13	302° 15'.5	34° 28'.8	59'.8	349° 40'.1	52'.8	236° 44'.2	50'.3	83° 52'.9	34'.7
	14	317° 18'.0	49° 27'.9	23° 00'.0 S	4° 40'.6	52'.2	251° 46'.9	50'.3	98° 55'.2	34'.7
	15	332° 20'.4	64° 27'.0	00'.1	19° 41'.0	51'.7	266° 49'.6	50'.2	113° 57'.5	34'.8
	16	347° 22'.9	79° 26'.0	00'.3	34° 41'.5	51'.2	281° 52'.2	50'.2	128° 59'.8	34'.8
	17	2° 25'.4	94° 25'.1	00'.4	49° 42'.0	50'.6	296° 54'.9	50'.2	144° 02'.1	34'.9
	18	17° 27'.8	109° 24'.2	00'.6	64° 42'.4	50'.1	311° 57'.6	50'.2	159° 04'.4	34'.9
	19	32° 30'.3	124° 23'.2	00'.7	79° 42'.9	49'.5	327° 00'.2	50'.2	174° 06'.7	35'.0
	20	47° 32'.8	139° 22'.3	00'.9	94° 43'.3	49'.0	342° 02'.9	50'.1	189° 09'.0	35'.0
	21	62° 35'.2	154° 21'.4	01'.0	109° 43'.8	48'.5	357° 05'.6	50'.1	204° 11'.3	35'.0
	22	77° 37'.7	169° 20'.4	01'.2	124° 44'.3	47'.9	12° 08'.2	50'.1	219° 13'.6	35'.1
	23	92° 40'.2	184° 19'.5	01'.3	139° 44'.7	47'.4	27° 10'.9	50'.1	234° 15'.9	35'.1
8 Tuesday	00	107° 42'.6	199° 18'.5	23° 01'.4 S	154° 45'.2	18° 46'.8 S	42° 13'.6	20° 50'.1 N	249° 18'.2	12° 35'.2 S
	01	122° 45'.1	214° 17'.6	01'.6	169° 45'.7	46'.3	57° 16'.2	50'.0	264° 20'.5	35'.2
	02	137° 47'.6	229° 16'.7	01'.7	184° 46'.1	45'.8	72° 18'.9	50'.0	279° 22'.8	35'.3
	03	152° 50'.0	244° 15'.7	01'.9	199° 46'.6	45'.2	87° 21'.5	50'.0	294° 25'.1	35'.3
	04	167° 52'.5	259° 14'.8	02'.0	214° 47'.0	44'.7	102° 24'.2	50'.0	309° 27'.4	35'.4
	05	182° 54'.9	274° 13'.8	02'.1	229° 47'.5	44'.1	117° 26'.9	49'.9	324° 29'.7	35'.4
	06	197° 57'.4	289° 12'.9	02'.3	244° 48'.0	43'.6	132° 29'.5	49'.9	339° 32'.0	35'.4
	07	212° 59'.9	304° 12'.0	02'.4	259° 48'.4	43'.0	147° 32'.2	49'.9	354° 34'.3	35'.5
	08	228° 02'.3	319° 11'.0	02'.5	274° 48'.9	42'.5	162° 34'.8	49'.9	9° 36'.6	35'.5
	09	243° 04'.8	334° 10'.1	02'.7	289° 49'.4	42'.0	177° 37'.5	49'.9	24° 38'.9	35'.6
	10	258° 07'.3	349° 09'.2	02'.8	304° 49'.8	41'.4	192° 40'.2	49'.8	39° 41'.2	35'.6
	11	273° 09'.7	4° 08'.2	02'.9	319° 50'.3	40'.9	207° 42'.8	49'.8	54° 43'.5	35'.7
	12	288° 12'.2	19° 07'.3	23° 03'.1 S	334° 50'.8	18° 40'.3 S	222° 45'.5	20° 49'.8 N	69° 45'.8	12° 35'.7 S
	13	303° 14'.7	34° 06'.3	03'.2	349° 51'.2	39'.8	237° 48'.1	49'.8	84° 48'.1	35'.8
	14	318° 17'.1	49° 05'.4	03'.3	4° 51'.7	39'.2	252° 50'.8	49'.8	99° 50'.3	35'.8
	15	333° 19'.6	64° 04'.5	03'.4	19° 52'.2	38'.7	267° 53'.5	49'.7	114° 52'.6	35'.9
	16	348° 22'.0	79° 03'.5	03'.6	34° 52'.6	38'.1	282° 56'.1	49'.7	129° 54'.9	35'.9
	17	3° 24'.5	94° 02'.6	03'.7	49° 53'.1	37'.6	297° 58'.8	49'.7	144° 57'.2	35'.9
	18	18° 27'.0	109° 01'.6	03'.8	64° 53'.6	37'.0	313° 01'.4	49'.7	159° 59'.5	36'.0
	19	33° 29'.4	124° 00'.7	03'.9	79° 54'.0	36'.5	328° 04'.1	49'.7	175° 01'.8	36'.0
	20	48° 31'.9	138° 59'.8	04'.0	94° 54'.5	36'.0	343° 06'.7	49'.6	190° 04'.1	36'.1
	21	63° 34'.4	153° 58'.8	04'.1	109° 55'.0	35'.4	358° 09'.4	49'.6	205° 06'.4	36'.1
	22	78° 36'.8	168° 57'.9	04'.3	124° 55'.4	34'.9	13° 12'.0	49'.6	220° 08'.7	36'.2
	23	93° 39'.3	183° 56'.9	04'.4	139° 55'.9	34'.3	28° 14'.7	49'.6	235° 11'.0	36'.2
9 Wednesday	00	108° 41'.8	198° 56'.0	23° 04'.5 S	154° 56'.4	18° 33'.8 S	43° 17'.4	20° 49'.6 N	250° 13'.3	12° 36'.2 S
	01	123° 44'.2	213° 55'.1	04'.6	169° 56'.8	33'.2	58° 20'.0	49'.5	265° 15'.6	36'.3
	02	138° 46'.7	228° 54'.1	04'.7	184° 57'.3	32'.7	73° 22'.7	49'.5	280° 17'.9	36'.3
	03	153° 49'.2	243° 53'.2	04'.8	199° 57'.8	32'.1	88° 25'.3	49'.5	295° 20'.2	36'.4
	04	168° 51'.6	258° 52'.2	04'.9	214° 58'.2	31'.6	103° 28'.0	49'.5	310° 22'.5	36'.4
	05	183° 54'.1	273° 51'.3	05'.0	229° 58'.7	31'.0	118° 30'.6	49'.5	325° 24'.8	36'.5
	06	198° 56'.5	288° 50'.3	05'.1	244° 59'.2	30'.5	133° 33'.3	49'.4	340° 27'.1	36'.5
	07	213° 59'.0	303° 49'.4	05'.2	259° 59'.6	29'.9	148° 35'.9	49'.4	355° 29'.4	36'.6
	08	229° 01'.5	318° 48'.5	05'.4	275° 00'.1	29'.4	163° 38'.6	49'.4	10° 31'.7	36'.6
	09	244° 03'.9	333° 47'.5	05'.5	290° 00'.6	28'.8	178° 41'.2	49'.4	25° 34'.0	36'.6
	10	259° 06'.4	348° 46'.6	05'.6	305° 01'.1	28'.3	193° 43'.9	49'.4	40° 36'.3	36'.7
	11	274° 08'.9	3° 45'.6	05'.7	320° 01'.5	27'.7	208° 46'.5	49'.3	55° 38'.6	36'.7
	12	289° 11'.3	18° 44'.7	23° 05'.8 S	335° 02'.0	18° 27'.1 S	223° 49'.2	20° 49'.3 N	70° 40'.9	12° 36'.8 S
	13	304° 13'.8	33° 43'.8	05'.8	350° 02'.5	26'.6	238° 51'.8	49'.3	85° 43'.2	36'.8
	14	319° 16'.3	48° 42'.8	05'.9	5° 02'.9	26'.0	253° 54'.5	49'.3	100° 45'.5	36'.9
	15	334° 18'.7	63° 41'.9	06'.0	20° 03'.4	25'.5	268° 57'.1	49'.3	115° 47'.8	36'.9
	16	349° 21'.2	78° 40'.9	06'.1	35° 03'.9	24'.9	283° 59'.8	49'.2	130° 50'.1	36'.9
	17	4° 23'.7	93° 40'.0	06'.2	50° 04'.3	24'.4	299° 02'.4	49'.2	145° 52'.4	37'.0
	18	19° 26'.1	108° 39'.0	06'.3	65° 04'.8	23'.8	314° 05'.1	49'.2	160° 54'.7	37'.0
	19	34° 28'.6	123° 38'.1	06'.4	80° 05'.3	23'.3	329° 07'.7	49'.2	175° 57'.0	37'.1
	20	49° 31'.0	138° 37'.2	06'.5	95° 05'.8	22'.7	344° 10'.4	49'.2	190° 59'.3	37'.1
	21	64° 33'.5	153° 36'.2	06'.6	110° 06'.2	22'.2	359° 13'.0	49'.1	206° 01'.6	37'.2
	22	79° 36'.0	168° 35'.3	06'.7	125° 06'.7	21'.6	14° 15'.7	49'.1	221° 03'.9	37'.2
	23	94° 38'.4	183° 34'.3	06'.8	140° 07'.2	21'.0	29° 18'.3	49'.1	236° 06'.3	37'.2
		M.P. 16:46	v -0'.9	d 0'.1	v 0'.5	d 0'.5	v 2'.7	d 0'.0	v 2'.3	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.4	40° 15'.4 S
Achernar	335° 26'.9	57° 10'.5 S
Acrux	173° 09'.4	63° 10'.1 S
Adhara	255° 12'.4	28° 59'.6 S
Aldebaran	290° 49'.4	16° 32'.0 N
Alioth	166° 20'.9	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.6 N
Alnair	27° 44'.5	46° 53'.9 S
Alnilam	275° 46'.3	1° 11'.8 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.5	26° 40'.2 N
Alpheratz	357° 43'.9	29° 10'.0 N
Altair	62° 08'.8	8° 54'.3 N
Ankaa	353° 16'.1	42° 14'.3 S
Antares	112° 26'.9	26° 27'.5 S
Arcturus	145° 56'.1	19° 06'.7 N
Atria	107° 29'.4	69° 02'.8 S
Avior	234° 17'.5	59° 33'.2 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.7	52° 42'.4 S
Capella	280° 34'.4	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.8 N
Denebola	182° 33'.8	14° 29'.7 N
Diphda	348° 56'.2	17° 55'.0 S
Dubhe	193° 51'.7	61° 40'.4 N
Elnath	278° 12'.6	28° 37'.0 N
Eltanin	90° 46'.8	51° 29'.3 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.5	29° 33'.2 S
Gacrux	172° 01'.1	57° 11'.0 S
Gienah	175° 52'.5	17° 36'.9 S
Hadar	148° 48'.4	60° 25'.9 S
Hamal	328° 01'.0	23° 31'.5 N
Kaus Aust.	83° 44'.6	34° 22'.5 S
Kochab	137° 20'.6	74° 05'.8 N
Markab	13° 38'.8	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.4 N
Menkent	148° 08'.0	36° 25'.9 S
Miaplacidus	221° 38'.8	69° 46'.2 S
Mirfak	308° 40'.4	49° 54'.6 N
Nunki	75° 59'.0	26° 16'.7 S
Peacock	53° 20'.3	56° 41'.5 S
Polaris	317° 41'.6	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 07'.0	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.4 S
Rigil Kent	139° 52'.3	60° 53'.0 S
Sabik	102° 13'.2	15° 44'.3 S
Schedar	349° 40'.9	56° 36'.9 N
Shaula	96° 22'.7	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.3 S
Spica	158° 31'.6	11° 13'.8 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.6	38° 47'.8 N
Zuben'ubi	137° 05'.9	16° 05'.7 S

	SHA	Mer.Pass.
Venus	91° 35'.9	10:43
Mars	47° 02'.6	13:41
Jupiter	294° 30'.9	21:07
Saturn	141° 35'.6	07:22

SUN				MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 27'.6	22° 22'.5 S	249° 04'.8	7'.3	16° 10'.0 S	8'.2	59'.5
193° 27'.3	22'.1	263° 31'.1	7'.2	18'.2	8'.1	
208° 27'.0	21'.8	277° 57'.3	7'.1	26'.3	8'.0	
223° 26'.8	21'.5	292° 23'.4	7'.1	34'.3	8'.0	59'.6
238° 26'.5	21'.2	306° 49'.5	6'.9	42'.3	7'.8	
253° 26'.2	20'.9	321° 15'.4	6'.9	50'.1	7'.7	
268° 26'.0	20'.5	335° 41'.3	6'.8	57'.8	7'.6	59'.7
283° 25'.7	20'.2	350° 07'.1	6'.7	17° 05'.4 S	7'.5	
298° 25'.4	19'.9	4° 32'.8	6'.6	12'.9	7'.4	
313° 25'.2	19'.6	18° 58'.4	6'.5	20'.3	7'.4	
328° 24'.9	19'.2	33° 23'.9	6'.5	27'.7	7'.2	59'.8
343° 24'.6	18'.9	47° 49'.4	6'.3	34'.9	7'.0	
358° 24'.4	22° 18'.6 S	62° 14'.7	6'.3	17° 41'.9 S	7'.0	59'.8
13° 24'.1	18'.3	76° 40'.0	6'.2	48'.9	6'.9	
28° 23'.8	17'.9	91° 05'.2	6'.1	55'.8	6'.8	59'.9
43° 23'.6	17'.6	105° 30'.3	6'.0	18° 02'.6 S	6'.6	
58° 23'.3	17'.3	119° 55'.3	6'.0	09'.2	6'.6	
73° 23'.0	17'.0	134° 20'.3	5'.8	15'.8	6'.4	60'.0
88° 22'.8	16'.6	148° 45'.1	5'.8	22'.2	6'.3	
103° 22'.5	16'.3	163° 09'.9	5'.7	28'.5	6'.2	
118° 22'.2	16'.0	177° 34'.6	5'.6	34'.7	6'.0	
133° 22'.0	15'.6	191° 59'.2	5'.5	40'.7	6'.0	60'.1
148° 21'.7	15'.3	206° 23'.7	5'.5	46'.7	5'.8	
163° 21'.4	15'.0	220° 48'.2	5'.4	52'.5	5'.7	
178° 21'.2	22° 14'.6 S	235° 12'.6	5'.3	18° 58'.2 S	5'.5	60'.1
193° 20'.9	14'.3	249° 36'.9	5'.2	19° 03'.7 S	5'.5	60'.2
208° 20'.6	13'.9	264° 01'.1	5'.2	09'.2	5'.3	
223° 20'.4	13'.6	278° 25'.3	5'.1	14'.5	5'.2	
238° 20'.1	13'.3	292° 49'.4	5'.0	19'.7	5'.1	
253° 19'.8	12'.9	307° 13'.4	4'.9	24'.8	4'.9	
268° 19'.6	12'.6	321° 37'.3	4'.9	29'.7	4'.8	60'.3
283° 19'.3	12'.2	336° 01'.2	4'.8	34'.5	4'.6	
298° 19'.0	11'.9	350° 25'.0	4'.7	39'.1	4'.6	
313° 18'.8	11'.6	4° 48'.7	4'.7	43'.7	4'.4	
328° 18'.5	11'.2	19° 12'.4	4'.6	48'.1	4'.2	60'.4
343° 18'.3	10'.9	33° 36'.0	4'.5	52'.3	4'.1	
358° 18'.0	22° 10'.5 S	47° 59'.5	4'.5	19° 56'.4 S	4'.0	60'.4
13° 17'.7	10'.2	62° 23'.0	4'.4	20° 00'.4 S	3'.9	
28° 17'.5	09'.8	76° 46'.4	4'.3	04'.3	3'.7	
43° 17'.2	09'.5	91° 09'.7	4'.3	08'.0	3'.5	60'.5
58° 16'.9	09'.1	105° 33'.0	4'.3	11'.5	3'.5	
73° 16'.7	08'.8	119° 56'.3	4'.2	15'.0	3'.2	
88° 16'.4	08'.4	134° 19'.5	4'.1	18'.2	3'.2	
103° 16'.2	08'.1	148° 42'.6	4'.1	21'.4	3'.0	
118° 15'.9	07'.7	163° 05'.7	4'.0	24'.4	2'.8	
133° 15'.6	07'.4	177° 28'.7	4'.0	27'.2	2'.7	60'.6
148° 15'.4	07'.0	191° 51'.7	3'.9	29'.9	2'.6	
163° 15'.1	06'.7	206° 14'.6	3'.9	32'.5	2'.4	
178° 14'.9	22° 06'.3 S	220° 37'.5	3'.8	20° 34'.9 S	2'.2	60'.6
193° 14'.6	06'.0	235° 00'.3	3'.8	37'.1	2'.1	
208° 14'.3	05'.6	249° 23'.1	3'.8	39'.2	2'.0	
223° 14'.1	05'.3	263° 45'.9	3'.7	41'.2	1'.8	60'.7
238° 13'.8	04'.9	278° 08'.6	3'.7	43'.0	1'.6	
253° 13'.6	04'.6	292° 31'.3	3'.6	44'.6	1'.5	
268° 13'.3	04'.2	306° 53'.9	3'.6	46'.1	1'.4	
283° 13'.0	03'.8	321° 16'.5	3'.6	47'.5	1'.2	
298° 12'.8	03'.5	335° 39'.1	3'.6	48'.7	1'.0	
313° 12'.5	03'.1	350° 01'.7	3'.5	49'.7	0'.9	
328° 12'.3	02'.8	4° 24'.2	3'.5	50'.6	0'.8	60'.8
343° 12'.0	02'.4	18° 46'.7	3'.5	51'.4	0'.6	
358° 11'.8	22° 02'.0 S	33° 09'.2	3'.4	20° 52'.0 S	0'.4	60'.8
13° 11'.5	01'.7	47° 31'.6	3'.5	52'.4	0'.3	
28° 11'.2	01'.3	61° 54'.1	3'.4	52'.7	0'.1	
43° 11'.0	00'.9	76° 16'.5	3'.4	52'.8	0'.1	
58° 10'.7	00'.6	90° 38'.9	3'.4	52'.7	0'.1	
73° 10'.5	00'.2	105° 01'.3	3'.3	52'.6	0'.4	
88° 10'.2	21° 59'.8 S	119° 23'.6	3'.4	52'.2	0'.5	
103° 10'.0	59'.5	133° 46'.0	3'.4	51'.7	0'.6	
118° 09'.7	59'.1	148° 08'.4	3'.3	51'.1	0'.9	
133° 09'.5	58'.7	162° 30'.7	3'.4	50'.2	0'.9	60'.9
148° 09'.2	58'.4	176° 53'.1	3'.3	49'.3	1'.1	
163° 08'.9	58'.0	191° 15'.4	3'.4	48'.2	1'.3	
SD 16'.3	d 0'.3	SD 16'.3		16'.5	16'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9
N 72°	08:15	10:18	-	06:26	-	-
N 70°	07:57	09:36	-	05:26	08:07	-
68°	07:44	09:07	11:08	04:51	06:45	08:25
66°	07:32	08:46	10:12	04:26	06:08	07:34
64°	07:22	08:28	09:39	04:07	05:41	07:02
62°	07:14	08:14	09:16	03:51	05:20	06:38
60°	07:06	08:02	08:57	03:38	05:04	06:19
N 58°	07:00	07:51	08:41	03:27	04:49	06:04
56°	06:54	07:42	08:28	03:17	04:37	05:50
54°	06:48	07:33	08:16	03:09	04:27	05:39
52°	06:43	07:26	08:06	03:01	04:18	05:29
50°	06:38	07:19	07:57	02:54	04:09	05:19
45°	06:27	07:04	07:38	02:40	03:51	05:00
N 40°	06:18	06:52	07:22	02:28	03:37	04:44
35°	06:09	06:41	07:09	02:17	03:25	04:31
30°	06:01	06:31	06:57	02:09	03:14	04:20
20°	05:46	06:13	06:37	01:53	02:56	04:00
N 10°	05:31	05:57	06:20	01:40	02:40	03:43
0°	05:15	05:41	06:03	01:28	02:26	03:27
S 10°	04:57	05:24	05:46	01:15	02:11	03:11
20°	04:35	05:04	05:29	01:02	01:55	02:54
30°	04:08	04:41	05:08	00:47	01:38	02:34
35°	03:50	04:26	04:56	00:39	01:27	02:23
40°	03:29	04:09	04:41	00:29	01:16	02:10
45°	03:00	03:48	04:25	00:18	01:02	01:55
S 50°	02:20	03:21	04:04	00:04	00:45	01:36
52°	01:56	03:07	03:54	-	00:37	01:27
54°	01:23	02:51	03:42	-	00:28	01:17
56°	-	02:31	03:29	-	00:19	01:06
58°	-	02:06	03:14	-	00:07	00:53
S 60°	-	01:30	02:56	23:55	-	00:38
S 62°	-	-	02:33	23:40	-	00:21

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 7	Moonset 8	Moonset 9
N 72°	-	13:56	16:00	08:42	-	-
N 70°	-	14:38	16:17	09:44	09:05	-
68°	13:06	15:07	16:30	10:19	10:27	10:56
66°	14:02	15:29	16:42	10:45	11:06	11:48
64°	14:35	15:46	16:52	11:05	11:33	12:20
62°	14:58	16:00	17:00	11:21	11:54	12:44
60°	15:17	16:12	17:08	11:35	12:11	13:03
N 58°	15:33	16:23	17:14	11:46	12:25	13:18
56°	15:46	16:32	17:20	11:57	12:38	13:32
54°	15:58	16:40	17:26	12:06	12:48	13:44
52°	16:08	16:48	17:31	12:14	12:58	13:54
50°	16:17	16:55	17:36	12:21	13:07	14:03
45°	16:36	17:10	17:46	12:37	13:25	14:23
N 40°	16:52	17:22	17:56	12:50	13:40	14:38
35°	17:05	17:33	18:04	13:00	13:52	14:52
30°	17:17	17:43	18:12	13:10	14:03	15:03
20°	17:37	18:00	18:28	13:27	14:22	15:23
N 10°	17:54	18:17	18:43	13:41	14:39	15:40
0°	18:10	18:33	18:59	13:55	14:54	15:57
S 10°	18:27	18:50	19:17	14:08	15:10	16:13
20°	18:45	19:09	19:38	14:23	15:26	16:30
30°	19:06	19:33	20:05	14:40	15:45	16:49
35°	19:18	19:47	20:23	14:49	15:56	17:01
40°	19:32	20:04	20:44	15:01	16:09	17:14
45°	19:49	20:25	21:12	15:14	16:24	17:30
S 50°	20:09	20:52	21:53	15:30	16:43	17:49
52°	20:19	21:06	22:16	15:37	16:51	17:58
54°	20:31	21:22	22:48	15:46	17:01	18:08
56°	20:43	21:41	-	15:55	17:12	18:19
58°	20:58	22:06	-	16:06	17:25	18:32
S 60°	21:16	22:40	-	16:18	17:39	18:48
S 62°	21:39	-	-	16:33	17:57	19:06

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
7	6 09	6 22	12:06	07:41	20:10	25d 25%
8	6 35	6 47	12:07	08:40	21:11	26d 15%
9	7 00	7 12	12:07	09:42	22:13	27d 8%

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2013 January 10, 11, 12 (Thur, Fri, Sat)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.7		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
10 Thursday 00	109° 40'.9	198° 33'.4	23° 06'.8 S	155° 07'.6	18° 20'.5 S	44° 21'.0	20° 49'.1 N	251° 08'.6	12° 37'.3 S
01	124° 43'.4	213° 32'.5	06'.9	170° 08'.1	19'.9	59° 23'.6	49'.1	266° 10'.9	37'.3
02	139° 45'.8	228° 31'.5	07'.0	185° 08'.6	19'.4	74° 26'.3	49'.0	281° 13'.2	37'.4
03	154° 48'.3	243° 30'.6	07'.1	200° 09'.1	18'.8	89° 28'.9	49'.0	296° 15'.5	37'.4
04	169° 50'.8	258° 29'.6	07'.2	215° 09'.5	18'.3	104° 31'.6	49'.0	311° 17'.8	37'.5
05	184° 53'.2	273° 28'.7	07'.2	230° 10'.0	17'.7	119° 34'.2	49'.0	326° 20'.1	37'.5
06	199° 55'.7	288° 27'.7	07'.3	245° 10'.5	17'.1	134° 36'.8	49'.0	341° 22'.4	37'.5
07	214° 58'.2	303° 26'.8	07'.4	260° 10'.9	16'.6	149° 39'.5	49'.0	356° 24'.7	37'.6
08	230° 00'.6	318° 25'.8	07'.5	275° 11'.4	16'.0	164° 42'.1	48'.9	11° 27'.0	37'.6
09	245° 03'.1	333° 24'.9	07'.5	290° 11'.9	15'.5	179° 44'.8	48'.9	26° 29'.3	37'.7
10	260° 05'.5	348° 24'.0	07'.6	305° 12'.4	14'.9	194° 47'.4	48'.9	41° 31'.6	37'.7
11	275° 08'.0	3° 23'.0	07'.7	320° 12'.8	14'.3	209° 50'.1	48'.9	56° 33'.9	37'.7
12	290° 10'.5	18° 22'.1	23° 07'.7 S	335° 13'.3	18° 13'.8 S	224° 52'.7	20° 48'.9 N	71° 36'.2	12° 37'.8 S
13	305° 12'.9	33° 21'.1	07'.8	350° 13'.8	13'.2	239° 55'.3	48'.8	86° 38'.5	37'.8
14	320° 15'.4	48° 20'.2	07'.9	5° 14'.3	12'.6	254° 58'.0	48'.8	101° 40'.8	37'.9
15	335° 17'.9	63° 19'.2	07'.9	20° 14'.7	12'.1	270° 00'.6	48'.8	116° 43'.1	37'.9
16	350° 20'.3	78° 18'.3	08'.0	35° 15'.2	11'.5	285° 03'.3	48'.8	131° 45'.4	38'.0
17	5° 22'.8	93° 17'.4	08'.1	50° 15'.7	11'.0	300° 05'.9	48'.8	146° 47'.7	38'.0
18	20° 25'.3	108° 16'.4	08'.1	65° 16'.2	10'.4	315° 08'.5	48'.8	161° 50'.0	38'.0
19	35° 27'.7	123° 15'.5	08'.2	80° 16'.6	09'.8	330° 11'.2	48'.7	176° 52'.3	38'.1
20	50° 30'.2	138° 14'.5	08'.2	95° 17'.1	09'.3	345° 13'.8	48'.7	191° 54'.6	38'.1
21	65° 32'.7	153° 13'.6	08'.3	110° 17'.6	08'.7	0° 16'.5	48'.7	206° 56'.9	38'.2
22	80° 35'.1	168° 12'.6	08'.4	125° 18'.1	08'.1	15° 19'.1	48'.7	221° 59'.2	38'.2
23	95° 37'.6	183° 11'.7	08'.4	140° 18'.5	07'.6	30° 21'.7	48'.7	237° 01'.5	38'.2
11 Friday 00	110° 40'.0	198° 10'.7	23° 08'.5 S	155° 19'.0	18° 07'.0 S	45° 24'.4	20° 48'.6 N	252° 03'.9	12° 38'.3 S
01	125° 42'.5	213° 09'.8	08'.5	170° 19'.5	06'.4	60° 27'.0	48'.6	267° 06'.2	38'.3
02	140° 45'.0	228° 08'.9	08'.6	185° 20'.0	05'.9	75° 29'.7	48'.6	282° 08'.5	38'.4
03	155° 47'.4	243° 07'.9	08'.6	200° 20'.4	05'.3	90° 32'.3	48'.6	297° 10'.8	38'.4
04	170° 49'.9	258° 07'.0	08'.7	215° 20'.9	04'.7	105° 34'.9	48'.6	312° 13'.1	38'.5
05	185° 52'.4	273° 06'.0	08'.7	230° 21'.4	04'.2	120° 37'.6	48'.6	327° 15'.4	38'.5
06	200° 54'.8	288° 05'.1	08'.8	245° 21'.9	03'.6	135° 40'.2	48'.5	342° 17'.7	38'.5
07	215° 57'.3	303° 04'.1	08'.8	260° 22'.4	03'.0	150° 42'.8	48'.5	357° 20'.0	38'.6
08	230° 59'.8	318° 03'.2	08'.9	275° 22'.8	02'.5	165° 45'.5	48'.5	12° 22'.3	38'.6
09	246° 02'.2	333° 02'.2	08'.9	290° 23'.3	01'.9	180° 48'.1	48'.5	27° 24'.6	38'.7
10	261° 04'.7	348° 01'.3	08'.9	305° 23'.8	01'.3	195° 50'.7	48'.5	42° 26'.9	38'.7
11	276° 07'.2	3° 00'.4	09'.0	320° 24'.3	00'.8	210° 53'.4	48'.5	57° 29'.2	38'.7
12	291° 09'.6	17° 59'.4	23° 09'.0 S	335° 24'.7	18° 00'.2 S	225° 56'.0	20° 48'.4 N	72° 31'.5	12° 38'.8 S
13	306° 12'.1	32° 58'.5	09'.1	350° 25'.2	17° 59'.6 S	240° 58'.6	48'.4	87° 33'.8	38'.8
14	321° 14'.5	47° 57'.5	09'.1	5° 25'.7	59'.1	256° 01'.3	48'.4	102° 36'.2	38'.9
15	336° 17'.0	62° 56'.6	09'.1	20° 26'.2	58'.5	271° 03'.9	48'.4	117° 38'.5	38'.9
16	351° 19'.5	77° 55'.6	09'.2	35° 26'.7	57'.9	286° 06'.5	48'.4	132° 40'.8	38'.9
17	6° 21'.9	92° 54'.7	09'.2	50° 27'.1	57'.3	301° 09'.2	48'.4	147° 43'.1	39'.0
18	21° 24'.4	107° 53'.7	09'.2	65° 27'.6	56'.8	316° 11'.8	48'.3	162° 45'.4	39'.0
19	36° 26'.9	122° 52'.8	09'.3	80° 28'.1	56'.2	331° 14'.4	48'.3	177° 47'.7	39'.1
20	51° 29'.3	137° 51'.8	09'.3	95° 28'.6	55'.6	346° 17'.1	48'.3	192° 50'.0	39'.1
21	66° 31'.8	152° 50'.9	09'.3	110° 29'.1	55'.1	1° 19'.7	48'.3	207° 52'.3	39'.1
22	81° 34'.3	167° 50'.0	09'.3	125° 29'.5	54'.5	16° 22'.3	48'.3	222° 54'.6	39'.2
23	96° 36'.7	182° 49'.0	09'.4	140° 30'.0	53'.9	31° 25'.0	48'.3	237° 56'.9	39'.2
12 Saturday 00	111° 39'.2	197° 48'.1	23° 09'.4 S	155° 30'.5	17° 53'.3 S	46° 27'.6	20° 48'.2 N	252° 59'.2	12° 39'.3 S
01	126° 41'.7	212° 47'.1	09'.4	170° 31'.0	52'.8	61° 30'.2	48'.2	268° 01'.6	39'.3
02	141° 44'.1	227° 46'.2	09'.4	185° 31'.5	52'.2	76° 32'.9	48'.2	283° 03'.9	39'.3
03	156° 46'.6	242° 45'.2	09'.5	200° 32'.0	51'.6	91° 35'.5	48'.2	298° 06'.2	39'.4
04	171° 49'.0	257° 44'.3	09'.5	215° 32'.4	51'.0	106° 38'.1	48'.2	313° 08'.5	39'.4
05	186° 51'.5	272° 43'.3	09'.5	230° 32'.9	50'.5	121° 40'.7	48'.2	328° 10'.8	39'.5
06	201° 54'.0	287° 42'.4	09'.5	245° 33'.4	49'.9	136° 43'.4	48'.1	343° 13'.1	39'.5
07	216° 56'.4	302° 41'.4	09'.5	260° 33'.9	49'.3	151° 46'.0	48'.1	358° 15'.4	39'.5
08	231° 58'.9	317° 40'.5	09'.5	275° 34'.4	48'.7	166° 48'.6	48'.1	13° 17'.7	39'.6
09	247° 01'.4	332° 39'.6	09'.6	290° 34'.8	48'.2	181° 51'.2	48'.1	28° 20'.0	39'.6
10	262° 03'.8	347° 38'.6	09'.6	305° 35'.3	47'.6	196° 53'.9	48'.1	43° 22'.3	39'.7
11	277° 06'.3	2° 37'.7	09'.6	320° 35'.8	47'.0	211° 56'.5	48'.1	58° 24'.7	39'.7
12	292° 08'.8	17° 36'.7	23° 09'.6 S	335° 36'.3	17° 46'.4 S	226° 59'.1	20° 48'.0 N	73° 27'.0	12° 39'.7 S
13	307° 11'.2	32° 35'.8	09'.6	350° 36'.8	45'.9	242° 01'.8	48'.0	88° 29'.3	39'.8
14	322° 13'.7	47° 34'.8	09'.6	5° 37'.3	45'.3	257° 04'.4	48'.0	103° 31'.6	39'.8
15	337° 16'.1	62° 33'.9	09'.6	20° 37'.7	44'.7	272° 07'.0	48'.0	118° 33'.9	39'.9
16	352° 18'.6	77° 32'.9	09'.6	35° 38'.2	44'.1	287° 09'.6	48'.0	133° 36'.2	39'.9
17	7° 21'.1	92° 32'.0	09'.6	50° 38'.7	43'.5	302° 12'.2	48'.0	148° 38'.5	39'.9
18	22° 23'.5	107° 31'.0	09'.6	65° 39'.2	43'.0	317° 14'.9	47'.9	163° 40'.8	40'.0
19	37° 26'.0	122° 30'.1	09'.6	80° 39'.7	42'.4	332° 17'.5	47'.9	178° 43'.1	40'.0
20	52° 28'.5	137° 29'.2	09'.6	95° 40'.2	41'.8	347° 20'.1	47'.9	193° 45'.5	40'.1
21	67° 30'.9	152° 28'.2	09'.6	110° 40'.6	41'.2	2° 22'.7	47'.9	208° 47'.8	40'.1
22	82° 33'.4	167° 27'.3	09'.6	125° 41'.1	40'.6	17° 25'.4	47'.9	223° 50'.1	40'.1
23	97° 35'.9	182° 26'.3	09'.6	140° 41'.6	40'.1	32° 28'.0	47'.9	238° 52'.4	40'.2
	M.P. 16:35	v -0'.9	d 0'.0	v 0'.5	d 0'.6	v 2'.6	d 0'.0	v 2'.3	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.4	40° 15'.4 S
Achernar	335° 27'.0	57° 10'.5 S
Acrux	173° 09'.4	63° 10'.1 S
Adhara	255° 12'.3	28° 59'.6 S
Aldebaran	290° 49'.4	16° 32'.0 N
Alioth	166° 20'.9	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.6 N
Alnair	27° 44'.5	46° 53'.9 S
Alnilam	275° 46'.3	1° 11'.8 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.5	26° 40'.1 N
Alpheratz	357° 43'.9	29° 10'.0 N
Altair	62° 08'.8	8° 54'.3 N
Ankaa	353° 16'.1	42° 14'.3 S
Antares	112° 26'.9	26° 27'.5 S
Arcturus	145° 56'.1	19° 06'.7 N
Atria	107° 29'.4	69° 02'.7 S
Avior	234° 17'.5	59° 33'.2 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.7	52° 42'.4 S
Capella	280° 34'.4	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.8 N
Denebola	182° 33'.8	14° 29'.7 N
Diphda	348° 56'.2	17° 55'.0 S
Dubhe	193° 51'.7	61° 40'.4 N
Elnath	278° 12'.6	28° 37'.0 N
Eltanin	90° 46'.8	51° 29'.2 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.5	29° 33'.2 S
Gacrux	172° 01'.0	57° 11'.0 S
Gienah	175° 52'.5	17° 36'.9 S
Hadar	148° 48'.4	60° 25'.9 S
Hamal	328° 01'.0	23° 31'.5 N
Kaus Aust.	83° 44'.6	34° 22'.5 S
Kochab	137° 20'.6	74° 05'.8 N
Markab	13° 38'.8	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.4 N
Menkent	148° 08'.0	36° 25'.9 S
Miaplacidus	221° 38'.8	69° 46'.3 S
Mirfak	308° 40'.4	49° 54'.6 N
Nunki	75° 59'.0	26° 16'.7 S
Peacock	53° 20'.3	56° 41'.5 S
Polaris	317° 42'.6	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 07'.0	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.4 S
Rigil Kent	139° 52'.2	60° 53'.0 S
Sabik	102° 13'.1	15° 44'.3 S
Schedar	349° 40'.9	56° 36'.9 N
Shaula	96° 22'.7	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.3 S
Spica	158° 31'.5	11° 13'.8 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.6	38° 47'.8 N
Zuben'ubi	137° 05'.8	16° 05'.7 S

	SHA	Mer.Pass.
Venus	87° 30'.7	10:48
Mars	44° 39'.0	13:38
Jupiter	294° 44'.3	20:55
Saturn	141° 23'.8	07:11

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
10 Thursday 00	178° 08'.7	21° 57'.6 S	205° 37'.8	3'.3	20° 46'.9 S	1'.5	60'.9
01	193° 08'.4	57'.2	220° 00'.1	3'.4	45'.4	1'.5	
02	208° 08'.2	56'.9	234° 22'.5	3'.4	43'.9	1'.8	
03	223° 07'.9	56'.5	248° 44'.9	3'.3	42'.1	1'.9	
04	238° 07'.7	56'.1	263° 07'.2	3'.4	40'.2	2'.0	
05	253° 07'.4	55'.7	277° 29'.6	3'.4	38'.2	2'.2	
06	268° 07'.2	55'.4	291° 52'.0	3'.4	36'.0	2'.4	
07	283° 06'.9	55'.0	306° 14'.4	3'.5	33'.6	2'.5	
08	298° 06'.7	54'.6	320° 36'.9	3'.4	31'.1	2'.7	
09	313° 06'.4	54'.2	334° 59'.3	3'.5	28'.4	2'.8	
10	328° 06'.2	53'.9	349° 21'.8	3'.5	25'.6	3'.0	
11	343° 05'.9	53'.5	3° 44'.3	3'.5	22'.6	3'.1	
12	358° 05'.7	21° 53'.1 S	18° 06'.8	3'.5	20° 19'.5 S	3'.3	60'.9
13	13° 05'.4	52'.7	32° 29'.3	3'.6	16'.2	3'.4	
14	28° 05'.2	52'.3	46° 51'.9	3'.6	12'.8	3'.5	
15	43° 04'.9	52'.0	61° 14'.5	3'.6	09'.3	3'.8	
16	58° 04'.7	51'.6	75° 37'.1	3'.7	05'.5	3'.8	
17	73° 04'.4	51'.2	89° 59'.8	3'.7	01'.7	4'.0	
18	88° 04'.2	50'.8	104° 22'.5	3'.8	19° 57'.7 S	4'.2	
19	103° 03'.9	50'.4	118° 45'.3	3'.7	53'.5	4'.3	
20	118° 03'.7	50'.0	133° 08'.0	3'.9	49'.2	4'.5	
21	133° 03'.4	49'.6	147° 30'.9	3'.8	44'.7	4'.6	
22	148° 03'.2	49'.3	161° 53'.7	3'.9	40'.1	4'.7	
23	163° 02'.9	48'.9	176° 16'.6	4'.0	35'.4	4'.9	
11 Friday 00	178° 02'.7	21° 48'.5 S	190° 39'.6	4'.0	19° 30'.5 S	5'.0	60'.9
01	193° 02'.4	48'.1	205° 02'.6	4'.1	25'.5	5'.2	60'.8
02	208° 02'.2	47'.7	219° 25'.7	4'.1	20'.3	5'.3	
03	223° 01'.9	47'.3	233° 48'.8	4'.1	15'.0	5'.4	
04	238° 01'.7	46'.9	248° 11'.9	4'.3	09'.6	5'.6	
05	253° 01'.4	46'.5	262° 35'.2	4'.2	04'.0	5'.7	
06	268° 01'.2	46'.1	276° 58'.4	4'.4	18° 58'.3 S	5'.9	
07	283° 00'.9	45'.7	291° 21'.8	4'.4	52'.4	5'.9	
08	298° 00'.7	45'.3	305° 45'.2	4'.4	46'.5	6'.2	
09	313° 00'.4	44'.9	320° 08'.6	4'.5	40'.3	6'.2	
10	328° 00'.2	44'.5	334° 32'.1	4'.6	34'.1	6'.4	
11	342° 59'.9	44'.1	348° 55'.7	4'.6	27'.7	6'.5	60'.7
12	357° 59'.7	21° 43'.7 S	3° 19'.3	4'.7	18° 21'.2 S	6'.6	60'.7
13	12° 59'.5	43'.3	17° 43'.0	4'.8	14'.6	6'.8	
14	27° 59'.2	42'.9	32° 06'.8	4'.8	07'.8	6'.9	
15	42° 59'.0	42'.5	46° 30'.6	4'.9	00'.9	7'.0	
16	57° 58'.7	42'.1	60° 54'.5	5'.0	17° 53'.9 S	7'.1	
17	72° 58'.5	41'.7	75° 18'.5	5'.1	46'.8	7'.3	
18	87° 58'.2	41'.3	89° 42'.6	5'.1	39'.5	7'.3	60'.6
19	102° 58'.0	40'.9	104° 06'.7	5'.2	32'.2	7'.5	
20	117° 57'.7	40'.5	118° 30'.9	5'.2	24'.7	7'.6	
21	132° 57'.5	40'.1	132° 55'.1	5'.4	17'.1	7'.8	
22	147° 57'.3	39'.7	147° 19'.5	5'.4	09'.3	7'.8	
23	162° 57'.0	39'.3	161° 43'.9	5'.5	01'.5	8'.0	
12 Saturday 00	177° 56'.8	21° 38'.9 S	176° 08'.4	5'.6	16° 53'.5 S	8'.0	60'.5
01	192° 56'.5	38'.5	190° 33'.0	5'.6	45'.5	8'.2	
02	207° 56'.3	38'.1	204° 57'.6	5'.7	37'.3	8'.3	
03	222° 56'.1	37'.7	219° 22'.3	5'.8	29'.0	8'.3	
04	237° 55'.8	37'.3	233° 47'.1	5'.9	20'.7	8'.5	
05	252° 55'.6	36'.9	248° 12'.0	6'.0	12'.2	8'.6	60'.4
06	267° 55'.3	36'.4	262° 37'.0	6'.1	03'.6	8'.7	
07	282° 55'.1	36'.0	277° 02'.1	6'.1	15° 54'.9 S	8'.8	
08	297° 54'.9	35'.6	291° 27'.2	6'.2	46'.1	8'.9	
09	312° 54'.6	35'.2	305° 52'.4	6'.3	37'.2	9'.0	
10	327° 54'.4	34'.8	320° 17'.7	6'.4	28'.2	9'.1	60'.3
11	342° 54'.1	34'.4	334° 43'.1	6'.5	19'.1	9'.2	
12	357° 53'.9	21° 34'.0 S	349° 08'.6	6'.5	15° 09'.9 S	9'.2	60'.3
13	12° 53'.7	33'.5	3° 34'.1	6'.6	00'.7	9'.4	
14	27° 53'.4	33'.1	17° 59'.7	6'.8	14° 51'.3 S	9'.4	60'.2
15	42° 53'.2	32'.7	32° 25'.5	6'.8	41'.9	9'.6	
16	57° 52'.9	32'.3	46° 51'.3	6'.9	32'.3	9'.6	
17	72° 52'.7	31'.9	61° 17'.2	6'.9	22'.7	9'.7	
18	87° 52'.5	31'.5	75° 43'.1	7'.1	13'.0	9'.8	60'.1
19	102° 52'.2	31'.0	90° 09'.2	7'.1	03'.2	9'.9	
20	117° 52'.0	30'.6	104° 35'.3	7'.3	13° 53'.3 S	9'.9	
21	132° 51'.8	30'.2	119° 01'.6	7'.3	43'.4	10'.1	60'.0
22	147° 51'.5	29'.8	133° 27'.9	7'.4	33'.3	10'.1	
23	162° 51'.3	29'.3	147° 54'.3	7'.5	23'.2	10'.1	
	SD 16'.3	d 0'.4	SD 16'.6		16'.5	16'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12
N 72°	08:09	10:07	-	-	-	10:36
N 70°	07:53	09:28	-	-	10:17	10:00
68°	07:40	09:02	10:52	09:16	09:30	09:34
66°	07:29	08:41	10:04	08:31	09:00	09:14
64°	07:20	08:25	09:34	08:01	08:37	08:58
62°	07:12	08:11	09:11	07:38	08:18	08:45
60°	07:04	07:59	08:53	07:20	08:03	08:33
N 58°	06:58	07:49	08:38	07:04	07:50	08:24
56°	06:52	07:40	08:25	06:51	07:39	08:15
54°	06:47	07:32	08:14	06:40	07:29	08:07
52°	06:42	07:25	08:04	06:30	07:20	08:00
50°	06:37	07:18	07:55	06:21	07:12	07:54
45°	06:27	07:03	07:37	06:02	06:55	07:40
N 40°	06:18	06:51	07:21	05:47	06:42	07:29
35°	06:09	06:41	07:08	05:33	06:30	07:19
30°	06:02	06:31	06:57	05:22	06:19	07:11
20°	05:47	06:14	06:37	05:02	06:02	06:56
N 10°	05:32	05:58	06:20	04:45	05:46	06:43
0°	05:16	05:42	06:04	04:29	05:32	06:31
S 10°	04:59	05:25	05:48	04:14	05:17	06:19
20°	04:38	05:06	05:31	03:57	05:02	06:06
30°	04:11	04:43	05:10	03:37	04:44	05:52
35°	03:54	04:29	04:58	03:26	04:33	05:43
40°	03:32	04:13	04:45	03:13	04:21	05:33
45°	03:05	03:52	04:28	02:57	04:07	05:22
S 50°	02:26	03:25	04:08	02:38	03:50	05:08
52°	02:03	03:12	03:58	02:29	03:42	05:01
54°	01:33	02:56	03:47	02:19	03:33	04:54
56°	00:34	02:38	03:34	02:08	03:23	04:46
58°	-	02:14	03:20	01:55	03:11	04:36
S 60°	-	01:41	03:02	01:40	02:58	04:26
S 62°	-	00:36	02:41	01:21	02:42	04:14

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 10	Moonset 11	Moonset 12
N 72°	-	14:10	16:08	-	-	15:12
N 70°	-	14:48	16:24	-	13:27	15:47
68°	13:25	15:15	16:37	12:18	14:13	16:11
66°	14:13	15:36	16:48	13:03	14:42	16:30
64°	14:43	15:52	16:57	13:32	15:05	16:45
62°	15:05	16:06	17:05	13:55	15:23	16:58
60°	15:23	16:17	17:12	14:13	15:37	17:08
N 58°	15:38	16:28	17:19	14:28	15:50	17:18
56°	15:51	16:37	17:24	14:41	16:01	17:26
54°	16:02	16:45	17:30	14:52	16:10	17:33
52°	16:12	16:52	17:35	15:02	16:18	17:39
50°	16:21	16:58	17:39	15:11	16:26	17:45
45°	16:40	17:13	17:49	15:29	16:42	17:57
N 40°	16:55	17:25	17:59	15:44	16:55	18:07
35°	17:08	17:36	18:07	15:57	17:06	18:16
30°	17:19	17:45	18:15	16:08	17:16	18:24
20°	17:39	18:02	18:30	16:27	17:33	18:37
N 10°	17:56	18:18	18:44	16:44	17:47	18:48
0°	18:12	18:34	19:00	16:59	18:00	18:59
S 10°	18:28	18:51	19:17	17:15	18:14	19:09
20°	18:45	19:09	19:38	17:31	18:28	19:20
30°	19:05	19:32	20:05	17:50	18:44	19:33
35°	19:17	19:46	20:22	18:01	18:54	19:40
40°	19:31	20:03	20:43	18:13	19:04	19:48
45°	19:47	20:23	21:10	18:28	19:17	19:58
S 50°	20:08	20:50	21:49	18:45	19:32	20:09
52°	20:17	21:03	22:11	18:54	19:39	20:15
54°	20:28	21:18	22:40	19:03	19:47	20:20
56°	20:41	21:37	23:33	19:14	19:55	20:27
58°	20:55	22:00	-	19:26	20:05	20:34
S 60°	21:12	22:32	-	19:40	20:16	20:42
S 62°	21:33	23:30	-	19:56	20:29	20:52

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
10	7 25	7 37	12:08	10:44	23:16	28d 3%
11	7 49	8 01	12:08	11:46	24:16	29d 0%
12	8 12	8 24	12:08	12:45	00:16	1d 1%

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2013 January 13, 14, 15 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.6		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
13 Sunday 00	112° 38'.3	197° 25'.4	23° 09'.6 S	155° 42'.1	17° 39'.5 S	47° 30'.6	20° 47'.9 N	253° 54'.7	12° 40'.2 S
01	127° 40'.8	212° 24'.4	09'.6	170° 42'.6	38'.9	62° 33'.2	47'.8	268° 57'.0	40'.2
02	142° 43'.3	227° 23'.5	09'.6	185° 43'.1	38'.3	77° 35'.8	47'.8	283° 59'.3	40'.3
03	157° 45'.7	242° 22'.5	09'.6	200° 43'.6	37'.7	92° 38'.5	47'.8	299° 01'.7	40'.3
04	172° 48'.2	257° 21'.6	09'.6	215° 44'.0	37'.2	107° 41'.1	47'.8	314° 04'.0	40'.4
05	187° 50'.6	272° 20'.6	09'.6	230° 44'.5	36'.6	122° 43'.7	47'.8	329° 06'.3	40'.4
06	202° 53'.1	287° 19'.7	09'.6	245° 45'.0	36'.0	137° 46'.3	47'.8	344° 08'.6	40'.4
07	217° 55'.6	302° 18'.8	09'.5	260° 45'.5	35'.4	152° 48'.9	47'.8	359° 10'.9	40'.5
08	232° 58'.0	317° 17'.8	09'.5	275° 46'.0	34'.8	167° 51'.6	47'.7	14° 13'.2	40'.5
09	248° 00'.5	332° 16'.9	09'.5	290° 46'.5	34'.2	182° 54'.2	47'.7	29° 15'.5	40'.6
10	263° 03'.0	347° 15'.9	09'.5	305° 47'.0	33'.7	197° 56'.8	47'.7	44° 17'.9	40'.6
11	278° 05'.4	2° 15'.0	09'.5	320° 47'.4	33'.1	212° 59'.4	47'.7	59° 20'.2	40'.6
12	293° 07'.9	17° 14'.0	23° 09'.5 S	335° 47'.9	17° 32'.5 S	228° 02'.0	20° 47'.7 N	74° 22'.5	12° 40'.7 S
13	308° 10'.4	32° 13'.1	09'.4	350° 48'.4	31'.9	243° 04'.7	47'.7	89° 24'.8	40'.7
14	323° 12'.8	47° 12'.1	09'.4	5° 48'.9	31'.3	258° 07'.3	47'.7	104° 27'.1	40'.7
15	338° 15'.3	62° 11'.2	09'.4	20° 49'.4	30'.7	273° 09'.9	47'.6	119° 29'.4	40'.8
16	353° 17'.8	77° 10'.2	09'.4	35° 49'.9	30'.1	288° 12'.5	47'.6	134° 31'.7	40'.8
17	8° 20'.2	92° 09'.3	09'.3	50° 50'.4	29'.6	303° 15'.1	47'.6	149° 34'.1	40'.9
18	23° 22'.7	107° 08'.4	09'.3	65° 50'.9	29'.0	318° 17'.7	47'.6	164° 36'.4	40'.9
19	38° 25'.1	122° 07'.4	09'.3	80° 51'.4	28'.4	333° 20'.3	47'.6	179° 38'.7	40'.9
20	53° 27'.6	137° 06'.5	09'.2	95° 51'.8	27'.8	348° 23'.0	47'.6	194° 41'.0	41'.0
21	68° 30'.1	152° 05'.5	09'.2	110° 52'.3	27'.2	3° 25'.6	47'.6	209° 43'.3	41'.0
22	83° 32'.5	167° 04'.6	09'.2	125° 52'.8	26'.6	18° 28'.2	47'.5	224° 45'.6	41'.1
23	98° 35'.0	182° 03'.6	09'.1	140° 53'.3	26'.0	33° 30'.8	47'.5	239° 48'.0	41'.1
14 Monday 00	113° 37'.5	197° 02'.7	23° 09'.1 S	155° 53'.8	17° 25'.4 S	48° 33'.4	20° 47'.5 N	254° 50'.3	12° 41'.1 S
01	128° 39'.9	212° 01'.7	09'.1	170° 54'.3	24'.8	63° 36'.0	47'.5	269° 52'.6	41'.2
02	143° 42'.4	227° 00'.8	09'.0	185° 54'.8	24'.3	78° 38'.6	47'.5	284° 54'.9	41'.2
03	158° 44'.9	241° 59'.8	09'.0	200° 55'.3	23'.7	93° 41'.2	47'.5	299° 57'.2	41'.2
04	173° 47'.3	256° 58'.9	09'.0	215° 55'.8	23'.1	108° 43'.9	47'.5	314° 59'.5	41'.3
05	188° 49'.8	271° 58'.0	08'.9	230° 56'.3	22'.5	123° 46'.5	47'.4	330° 01'.9	41'.3
06	203° 52'.3	286° 57'.0	08'.9	245° 56'.7	21'.9	138° 49'.1	47'.4	345° 04'.2	41'.4
07	218° 54'.7	301° 56'.1	08'.8	260° 57'.2	21'.3	153° 51'.7	47'.4	0° 06'.5	41'.4
08	233° 57'.2	316° 55'.1	08'.8	275° 57'.7	20'.7	168° 54'.3	47'.4	15° 08'.8	41'.4
09	248° 59'.6	331° 54'.2	08'.7	290° 58'.2	20'.1	183° 56'.9	47'.4	30° 11'.1	41'.5
10	264° 02'.1	346° 53'.2	08'.7	305° 58'.7	19'.5	198° 59'.5	47'.4	45° 13'.4	41'.5
11	279° 04'.6	1° 52'.3	08'.6	320° 59'.2	18'.9	214° 02'.1	47'.4	60° 15'.8	41'.5
12	294° 07'.0	16° 51'.3	23° 08'.6 S	335° 59'.7	17° 18'.3 S	229° 04'.7	20° 47'.3 N	75° 18'.1	12° 41'.6 S
13	309° 09'.5	31° 50'.4	08'.5	351° 00'.2	17'.8	244° 07'.3	47'.3	90° 20'.4	41'.6
14	324° 12'.0	46° 49'.4	08'.5	6° 00'.7	17'.2	259° 10'.0	47'.3	105° 22'.7	41'.6
15	339° 14'.4	61° 48'.5	08'.4	21° 01'.2	16'.6	274° 12'.6	47'.3	120° 25'.0	41'.7
16	354° 16'.9	76° 47'.6	08'.4	36° 01'.7	16'.0	289° 15'.2	47'.3	135° 27'.4	41'.7
17	9° 19'.4	91° 46'.6	08'.3	51° 02'.2	15'.4	304° 17'.8	47'.3	150° 29'.7	41'.8
18	24° 21'.8	106° 45'.7	08'.3	66° 02'.6	14'.8	319° 20'.4	47'.3	165° 32'.0	41'.8
19	39° 24'.3	121° 44'.7	08'.2	81° 03'.1	14'.2	334° 23'.0	47'.3	180° 34'.3	41'.8
20	54° 26'.7	136° 43'.8	08'.2	96° 03'.6	13'.6	349° 25'.6	47'.2	195° 36'.6	41'.9
21	69° 29'.2	151° 42'.8	08'.1	111° 04'.1	13'.0	4° 28'.2	47'.2	210° 39'.0	41'.9
22	84° 31'.7	166° 41'.9	08'.0	126° 04'.6	12'.4	19° 30'.8	47'.2	225° 41'.3	41'.9
23	99° 34'.1	181° 40'.9	08'.0	141° 05'.1	11'.8	34° 33'.4	47'.2	240° 43'.6	42'.0
15 Tuesday 00	114° 36'.6	196° 40'.0	23° 07'.9 S	156° 05'.6	17° 11'.2 S	49° 36'.0	20° 47'.2 N	255° 45'.9	12° 42'.0 S
01	129° 39'.1	211° 39'.1	07'.8	171° 06'.1	10'.6	64° 38'.6	47'.2	270° 48'.2	42'.0
02	144° 41'.5	226° 38'.1	07'.8	186° 06'.6	10'.0	79° 41'.2	47'.2	285° 50'.6	42'.1
03	159° 44'.0	241° 37'.2	07'.7	201° 07'.1	09'.4	94° 43'.8	47'.2	300° 52'.9	42'.1
04	174° 46'.5	256° 36'.2	07'.6	216° 07'.6	08'.8	109° 46'.4	47'.1	315° 55'.2	42'.2
05	189° 48'.9	271° 35'.3	07'.6	231° 08'.1	08'.2	124° 49'.0	47'.1	330° 57'.5	42'.2
06	204° 51'.4	286° 34'.3	07'.5	246° 08'.6	07'.6	139° 51'.6	47'.1	345° 59'.8	42'.2
07	219° 53'.9	301° 33'.4	07'.4	261° 09'.1	07'.0	154° 54'.2	47'.1	1° 02'.2	42'.3
08	234° 56'.3	316° 32'.5	07'.3	276° 09'.6	06'.4	169° 56'.8	47'.1	16° 04'.5	42'.3
09	249° 58'.8	331° 31'.5	07'.3	291° 10'.1	05'.8	184° 59'.4	47'.1	31° 06'.8	42'.3
10	265° 01'.2	346° 30'.6	07'.2	306° 10'.6	05'.2	200° 02'.0	47'.1	46° 09'.1	42'.4
11	280° 03'.7	1° 29'.6	07'.1	321° 11'.1	04'.6	215° 04'.6	47'.1	61° 11'.4	42'.4
12	295° 06'.2	16° 28'.7	23° 07'.0 S	336° 11'.6	17° 04'.0 S	230° 07'.2	20° 47'.0 N	76° 13'.8	12° 42'.4 S
13	310° 08'.6	31° 27'.7	07'.0	351° 12'.1	03'.4	245° 09'.8	47'.0	91° 16'.1	42'.5
14	325° 11'.1	46° 26'.8	06'.9	6° 12'.5	02'.8	260° 12'.4	47'.0	106° 18'.4	42'.5
15	340° 13'.6	61° 25'.8	06'.8	21° 13'.0	02'.2	275° 15'.0	47'.0	121° 20'.7	42'.5
16	355° 16'.0	76° 24'.9	06'.7	36° 13'.5	01'.6	290° 17'.6	47'.0	136° 23'.1	42'.6
17	10° 18'.5	91° 24'.0	06'.6	51° 14'.0	01'.0	305° 20'.2	47'.0	151° 25'.4	42'.6
18	25° 21'.0	106° 23'.0	06'.5	66° 14'.5	00'.4	320° 22'.8	47'.0	166° 27'.7	42'.7
19	40° 23'.4	121° 22'.1	06'.4	81° 15'.0	16° 59'.8 S	335° 25'.4	47'.0	181° 30'.0	42'.7
20	55° 25'.9	136° 21'.1	06'.4	96° 15'.5	59'.2	350° 28'.0	47'.0	196° 32'.3	42'.7
21	70° 28'.4	151° 20'.2	06'.3	111° 16'.0	58'.6	5° 30'.6	46'.9	211° 34'.7	42'.8
22	85° 30'.8	166° 19'.3	06'.2	126° 16'.5	58'.0	20° 33'.2	46'.9	226° 37'.0	42'.8
23	100° 33'.3	181° 18'.3	06'.1	141° 17'.0	57'.4	35° 35'.8	46'.9	241° 39'.3	42'.8
	M.P. 16:23	v -0'.9	d 0'.1	v 0'.5	d 0'.6	v 2'.6	d 0'.0	v 2'.3	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.4	40° 15'.4 S
Achernar	335° 27'.0	57° 10'.5 S
Acrux	173° 09'.4	63° 10'.1 S
Adhara	255° 12'.3	28° 59'.6 S
Aldebaran	290° 49'.4	16° 32'.0 N
Alioth	166° 20'.9	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.6 N
Alnair	27° 44'.5	46° 53'.9 S
Alnilam	275° 46'.3	1° 11'.8 S
Alphard	217° 56'.0	8° 43'.1 S
Alphecca	126° 11'.4	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.9 N
Altair	62° 08'.8	8° 54'.3 N
Ankaa	353° 16'.1	42° 14'.3 S
Antares	112° 26'.8	26° 27'.5 S
Arcturus	145° 56'.0	19° 06'.7 N
Atria	107° 29'.3	69° 02'.7 S
Avior	234° 17'.4	59° 33'.2 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.7	52° 42'.4 S
Capella	280° 34'.4	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.8 N
Denebola	182° 33'.8	14° 29'.7 N
Diphda	348° 56'.2	17° 55'.0 S
Dubhe	193° 51'.6	61° 40'.4 N
Elnath	278° 12'.6	28° 37'.0 N
Eltanin	90° 46'.8	51° 29'.2 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.5	29° 33'.2 S
Gacrux	172° 01'.0	57° 11'.0 S
Gienah	175° 52'.4	17° 36'.9 S
Hadar	148° 48'.3	60° 25'.9 S
Hamal	328° 01'.0	23° 31'.5 N
Kaus Aust.	83° 44'.5	34° 22'.5 S
Kochab	137° 20'.5	74° 05'.8 N
Markab	13° 38'.8	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.4 N
Menkent	148° 07'.9	36° 25'.9 S
Miaplacidus	221° 38'.8	69° 46'.3 S
Mirfak	308° 40'.4	49° 54'.6 N
Nunki	75° 59'.0	26° 16'.7 S
Peacock	53° 20'.3	56° 41'.5 S
Polaris	317° 43'.9	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 07'.0	12° 33'.1 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.0	8° 11'.4 S
Rigil Kent	139° 52'.2	60° 53'.0 S
Sabik	102° 13'.1	15° 44'.3 S
Schedar	349° 40'.9	56° 36'.8 N
Shaula	96° 22'.6	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.3 S
Spica	158° 31'.5	11° 13'.8 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.6	38° 47'.8 N
Zuben'ubi	137° 05'.8	16° 05'.7 S

	SHA	Mer.Pass.
Venus	83° 25'.2	10:53
Mars	42° 16'.3	13:36
Jupiter	294° 55'.9	20:42
Saturn	141° 12'.8	07:00

SUN				MOON				
GHA	Dec	GHA	v	Dec	d	HP
177° 51'.0	21° 28'.9 S	162° 20'.8	7'.6	13° 13'.1 S	10'.3	60'.0
192° 50'.8	28'.5	176° 47'.4	7'.6	02'.8	10'.3	59'.9
207° 50'.6	28'.1	191° 14'.0	7'.8	12° 52'.5 S	10'.4	
222° 50'.3	27'.6	205° 40'.8	7'.8	42'.1	10'.5	
237° 50'.1	27'.2	220° 07'.6	7'.9	31'.6	10'.5	59'.8
252° 49'.9	26'.8	234° 34'.5	8'.0	21'.1	10'.6	
267° 49'.6	26'.4	249° 01'.5	8'.1	10'.5	10'.7	
282° 49'.4	25'.9	263° 28'.6	8'.2	11° 59'.8 S	10'.7	
297° 49'.2	25'.5	277° 55'.8	8'.3	49'.1	10'.8	59'.7
312° 48'.9	25'.1	292° 23'.1	8'.3	38'.3	10'.8	
327° 48'.7	24'.6	306° 50'.4	8'.4	27'.5	10'.9	
342° 48'.5	24'.2	321° 17'.8	8'.6	16'.6	10'.9	59'.6
357° 48'.2	21° 23'.8 S	335° 45'.4	8'.6	11° 05'.7 S	11'.0	59'.6
12° 48'.0	23'.3	350° 13'.0	8'.6	10° 54'.7 S	11'.1	
27° 47'.8	22'.9	4° 40'.6	8'.8	43'.6	11'.1	59'.5
42° 47'.5	22'.5	19° 08'.4	8'.9	32'.5	11'.2	
57° 47'.3	22'.0	33° 36'.3	8'.9	21'.3	11'.2	
72° 47'.1	21'.6	48° 04'.2	9'.0	10'.1	11'.2	59'.4
87° 46'.9	21'.2	62° 32'.2	9'.1	9° 58'.9 S	11'.3	
102° 46'.6	20'.7	77° 00'.3	9'.2	47'.6	11'.3	
117° 46'.4	20'.3	91° 28'.5	9'.2	36'.3	11'.4	59'.3
132° 46'.2	19'.8	105° 56'.7	9'.4	24'.9	11'.4	
147° 45'.9	19'.4	120° 25'.1	9'.4	13'.5	11'.5	
162° 45'.7	19'.0	134° 53'.5	9'.5	02'.0	11'.5	59'.2
177° 45'.5	21° 18'.5 S	149° 22'.0	9'.5	8° 50'.5 S	11'.5	59'.2
192° 45'.2	18'.1	163° 50'.5	9'.7	39'.0	11'.6	59'.1
207° 45'.0	17'.6	178° 19'.2	9'.7	27'.4	11'.6	
222° 44'.8	17'.2	192° 47'.9	9'.8	15'.8	11'.6	
237° 44'.6	16'.7	207° 16'.7	9'.9	04'.2	11'.7	59'.0
252° 44'.3	16'.3	221° 45'.6	10'.0	7° 52'.5 S	11'.7	
267° 44'.1	15'.8	236° 14'.6	10'.0	40'.8	11'.7	
282° 43'.9	15'.4	250° 43'.6	10'.1	29'.1	11'.8	58'.9
297° 43'.7	15'.0	265° 12'.7	10'.2	17'.3	11'.7	
312° 43'.4	14'.5	279° 41'.9	10'.2	05'.6	11'.8	
327° 43'.2	14'.1	294° 11'.1	10'.3	6° 53'.8 S	11'.8	58'.8
342° 43'.0	13'.6	308° 40'.4	10'.4	42'.0	11'.9	
357° 42'.8	21° 13'.2 S	323° 09'.8	10'.5	6° 30'.1 S	11'.8	58'.7
12° 42'.5	12'.7	337° 39'.3	10'.5	18'.3	11'.9	
27° 42'.3	12'.3	352° 08'.8	10'.6	06'.4	11'.9	
42° 42'.1	11'.8	6° 38'.4	10'.7	5° 54'.5 S	11'.9	58'.6
57° 41'.9	11'.4	21° 08'.1	10'.7	42'.6	11'.9	
72° 41'.6	10'.9	35° 37'.8	10'.8	30'.7	11'.9	
87° 41'.4	10'.4	50° 07'.6	10'.9	18'.8	12'.0	58'.5
102° 41'.2	10'.0	64° 37'.5	10'.9	06'.8	11'.9	
117° 41'.0	09'.5	79° 07'.4	11'.0	4° 54'.9 S	12'.0	58'.4
132° 40'.7	09'.1	93° 37'.4	11'.1	42'.9	12'.0	
147° 40'.5	08'.6	108° 07'.5	11'.1	30'.9	11'.9	
162° 40'.3	08'.2	122° 37'.6	11'.2	19'.0	12'.0	58'.3
177° 40'.1	21° 07'.7 S	137° 07'.8	11'.3	4° 07'.0 S	12'.0	58'.3
192° 39'.9	07'.2	151° 38'.1	11'.3	3° 55'.0 S	12'.0	58'.2
207° 39'.6	06'.8	166° 08'.4	11'.4	43'.0	12'.0	
222° 39'.4	06'.3	180° 38'.8	11'.4	31'.0	12'.0	
237° 39'.2	05'.9	195° 09'.2	11'.5	19'.0	12'.0	58'.1
252° 39'.0	05'.4	209° 39'.7	11'.5	07'.0	12'.0	
267° 38'.7	04'.9	224° 10'.2	11'.6	2° 55'.0 S	12'.0	
282° 38'.5	04'.5	238° 40'.8	11'.7	43'.0	12'.0	58'.0
297° 38'.3	04'.0	253° 11'.5	11'.7	31'.0	11'.9	
312° 38'.1	03'.5	267° 42'.2	11'.8	19'.1	12'.0	57'.9
327° 37'.9	03'.1	282° 13'.0	11'.8	07'.1	12'.0	
342° 37'.7	02'.6	296° 43'.8	11'.9	1° 55'.1 S	12'.0	
357° 37'.4	21° 02'.1 S	311° 14'.7	11'.9	1° 43'.1 S	11'.9	57'.8
12° 37'.2	01'.7	325° 45'.6	12'.0	31'.2	12'.0	
27° 37'.0	01'.2	340° 16'.6	12'.0	19'.2	11'.9	57'.7
42° 36'.8	00'.7	354° 47'.6	12'.1	07'.3	11'.9	
57° 36'.6	00'.3	9° 18'.7	12'.1	0° 55'.4 S	11'.9	
72° 36'.3	20° 59'.8 S	23° 49'.8	12'.2	43'.5	11'.9	57'.6
87° 36'.1	59'.3	38° 21'.0	12'.2	31'.6	11'.9	
102° 35'.9	58'.9	52° 52'.2	12'.2	19'.7	11'.9	57'.5
117° 35'.7	58'.4	67° 23'.4	12'.3	07'.8	11'.8	
132° 35'.5	57'.9	81° 54'.7	12'.4	0° 04'.0 N	11'.9	
147° 35'.3	57'.4	96° 26'.1	12'.4	15'.9	11'.8	57'.4
162° 35'.1	57'.0	110° 57'.5	12'.4	27'.7	11'.8	
SD 16'.3	d 0'.5	SD	16'.2	16'.0	15'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 13	Moonrise 14	Moonrise 15
N 72°	08:02	09:55	-	10:10	09:53	09:39
N 70°	07:47	09:20	-	09:50	09:43	09:36
68°	07:35	08:55	10:37	09:35	09:35	09:34
66°	07:25	08:36	09:55	09:23	09:28	09:31
64°	07:16	08:20	09:27	09:12	09:22	09:30
62°	07:08	08:07	09:06	09:03	09:17	09:28
60°	07:02	07:56	08:49	08:55	09:12	09:27
N 58°	06:56	07:46	08:34	08:49	09:08	09:25
56°	06:50	07:37	08:22	08:42	09:05	09:24
54°	06:45	07:30	08:11	08:37	09:02	09:23
52°	06:40	07:23	08:02	08:32	08:59	09:22
50°	06:36	07:16	07:53	08:28	08:56	09:21
45°	06:26	07:02	07:35	08:18	08:50	09:20
N 40°	06:17	06:51	07:20	08:10	08:46	09:18
35°	06:09	06:40	07:08	08:03	08:41	09:17
30°	06:02	06:31	06:57	07:57	08:38	09:16
20°	05:47	06:14	06:38	07:46	08:31	09:14
N 10°	05:33	05:59	06:21	07:37	08:26	09:12
0°	05:17	05:43	06:05	07:28	08:20	09:10
S 10°	05:00	05:27	05:50	07:19	08:15	09:08
20°	04:40	05:09	05:33	07:09	08:09	09:07
30°	04:14	04:46	05:13	06:59	08:03	09:05
35°	03:57	04:32	05:01	06:52	07:59	09:04
40°	03:36	04:16	04:48	06:45	07:55	09:02
45°	03:10	03:56	04:32	06:37	07:50	09:01
S 50°	02:32	03:30	04:12	06:27	07:44	08:59
52°	02:11	03:17	04:03	06:22	07:41	08:58
54°	01:44	03:02	03:52	06:17	07:38	08:57
56°	00:58	02:45	03:40	06:11	07:35	08:56
58°	-	02:22	03:26	06:05	07:31	08:55
S 60°	-	01:53	03:09	05:57	07:27	08:54
S 62°	-	01:03	02:49	05:49	07:23	08:52

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 13	Moonset 14	Moonset 15
N 72°	-	14:24	16:17	17:34	19:39	21:34
N 70°	-	14:59	16:32	17:51	19:46	21:34
68°	13:42	15:24	16:44	18:05	19:52	21:34
66°	14:24	15:43	16:54	18:16	19:57	21:34
64°	14:51	15:59	17:03	18:25	20:02	21:34
62°	15:13	16:12	17:10	18:33	20:05	21:34
60°	15:30	16:23	17:17	18:40	20:09	21:34
N 58°	15:44	16:33	17:23	18:46	20:11	21:34
56°	15:57	16:41	17:29	18:51	20:14	21:34
54°	16:07	16:49	17:34	18:56	20:16	21:34
52°	16:17	16:56	17:38	19:00	20:18	21:33
50°	16:25	17:02	17:43	19:04	20:20	21:33
45°	16:43	17:16	17:53	19:12	20:24	21:33
N 40°	16:58	17:28	18:01	19:19	20:27	21:33
35°	17:11	17:38	18:09	19:25	20:30	21:33
30°	17:22	17:48	18:17	19:30	20:33	21:33
20°	17:41	18:04	18:31	19:38	20:37	21:33
N 10°	17:57	18:20	18:46	19:46	20:41	21:33
0°	18:13	18:35	19:01	19:53	20:44	21:33
S 10°	18:29	18:51	19:18	20:00	20:48	21:33
20°	18:46	19:10	19:38	20:08	20:52	21:33
30°	19:05	19:32	20:04	20:16	20:56	21:32
35°	19:17	19:46	20:21	20:21	20:58	21:32
40°	19:30	20:02	20:41	20:27	21:01	21:32
45°	19:46	20:22	21:08	20:33	21:04	21:32
S 50°	20:05	20:47	21:45	20:40	21:07	21:32
52°	20:15	21:00	22:05	20:44	21:09	21:32
54°	20:25	21:15	22:32	20:48	21:11	21:32
56°	20:37	21:32	23:15	20:52	21:13	21:31
58°	20:51	21:54	-	20:57	21:15	21:31
S 60°	21:07	22:23	-	21:02	21:17	21:31
S 62°	21:27	23:09	-	21:08	21:20	21:31

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
13	8 35	8 47	12:09	13:41	01:13	2d 4%
14	8 58	9 09	12:09	14:33	02:07	3d 10%
15	9 19	9 30	12:09	15:22	02:57	4d 17%

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2013 January 16, 17, 18 (Wed, Thur, Fri)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.6		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
16 Wednesday 00	115° 35'.7	196° 17'.4	23° 06'.0 S	156° 17'.5	16° 56'.8 S	50° 38'.4	20° 46'.9 N	256° 41'.6	12° 42'.9 S
01	130° 38'.2	211° 16'.4	05'.9	171° 18'.0	56'.2	65° 41'.0	46'.9	271° 44'.0	42'.9
02	145° 40'.7	226° 15'.5	05'.8	186° 18'.5	55'.6	80° 43'.6	46'.9	286° 46'.3	42'.9
03	160° 43'.1	241° 14'.5	05'.7	201° 19'.0	55'.0	95° 46'.2	46'.9	301° 48'.6	43'.0
04	175° 45'.6	256° 13'.6	05'.6	216° 19'.5	54'.4	110° 48'.8	46'.9	316° 50'.9	43'.0
05	190° 48'.1	271° 12'.7	05'.5	231° 20'.0	53'.8	125° 51'.4	46'.9	331° 53'.3	43'.0
06	205° 50'.5	286° 11'.7	05'.4	246° 20'.5	53'.2	140° 54'.0	46'.8	346° 55'.6	43'.1
07	220° 53'.0	301° 10'.8	05'.3	261° 21'.0	52'.6	155° 56'.6	46'.8	1° 57'.9	43'.1
08	235° 55'.5	316° 09'.8	05'.2	276° 21'.5	52'.0	170° 59'.2	46'.8	17° 00'.2	43'.1
09	250° 57'.9	331° 08'.9	05'.1	291° 22'.0	51'.3	186° 01'.7	46'.8	32° 02'.6	43'.2
10	266° 00'.4	346° 07'.9	05'.0	306° 22'.5	50'.7	201° 04'.3	46'.8	47° 04'.9	43'.2
11	281° 02'.8	1° 07'.0	04'.9	321° 23'.0	50'.1	216° 06'.9	46'.8	62° 07'.2	43'.2
12	296° 05'.3	16° 06'.1	23° 04'.8 S	336° 23'.5	16° 49'.5 S	231° 09'.5	20° 46'.8 N	77° 09'.5	12° 43'.3 S
13	311° 07'.8	31° 05'.1	04'.6	351° 24'.0	48'.9	246° 12'.1	46'.8	92° 11'.9	43'.3
14	326° 10'.2	46° 04'.2	04'.5	6° 24'.5	48'.3	261° 14'.7	46'.8	107° 14'.2	43'.3
15	341° 12'.7	61° 03'.2	04'.4	21° 25'.0	47'.7	276° 17'.3	46'.8	122° 16'.5	43'.4
16	356° 15'.2	76° 02'.3	04'.3	36° 25'.5	47'.1	291° 19'.9	46'.7	137° 18'.8	43'.4
17	11° 17'.6	91° 01'.4	04'.2	51° 26'.0	46'.5	306° 22'.5	46'.7	152° 21'.2	43'.5
18	26° 20'.1	106° 00'.4	04'.1	66° 26'.5	45'.9	321° 25'.1	46'.7	167° 23'.5	43'.5
19	41° 22'.6	120° 59'.5	04'.0	81° 27'.0	45'.3	336° 27'.6	46'.7	182° 25'.8	43'.5
20	56° 25'.0	135° 58'.5	03'.8	96° 27'.6	44'.7	351° 30'.2	46'.7	197° 28'.2	43'.6
21	71° 27'.5	150° 57'.6	03'.7	111° 28'.1	44'.0	6° 32'.8	46'.7	212° 30'.5	43'.6
22	86° 30'.0	165° 56'.7	03'.6	126° 28'.6	43'.4	21° 35'.4	46'.7	227° 32'.8	43'.6
23	101° 32'.4	180° 55'.7	03'.5	141° 29'.1	42'.8	36° 38'.0	46'.7	242° 35'.1	43'.7
17 Thursday 00	116° 34'.9	195° 54'.8	23° 03'.4 S	156° 29'.6	16° 42'.2 S	51° 40'.6	20° 46'.7 N	257° 37'.5	12° 43'.7 S
01	131° 37'.3	210° 53'.8	03'.2	171° 30'.1	41'.6	66° 43'.2	46'.7	272° 39'.8	43'.7
02	146° 39'.8	225° 52'.9	03'.1	186° 30'.6	41'.0	81° 45'.8	46'.6	287° 42'.1	43'.8
03	161° 42'.3	240° 52'.0	03'.0	201° 31'.1	40'.4	96° 48'.3	46'.6	302° 44'.4	43'.8
04	176° 44'.7	255° 51'.0	02'.8	216° 31'.6	39'.8	111° 50'.9	46'.6	317° 46'.8	43'.8
05	191° 47'.2	270° 50'.1	02'.7	231° 32'.1	39'.1	126° 53'.5	46'.6	332° 49'.1	43'.9
06	206° 49'.7	285° 49'.1	02'.6	246° 32'.6	38'.5	141° 56'.1	46'.6	347° 51'.4	43'.9
07	221° 52'.1	300° 48'.2	02'.5	261° 33'.1	37'.9	156° 58'.7	46'.6	2° 53'.8	43'.9
08	236° 54'.6	315° 47'.3	02'.3	276° 33'.6	37'.3	172° 01'.3	46'.6	17° 56'.1	44'.0
09	251° 57'.1	330° 46'.3	02'.2	291° 34'.1	36'.7	187° 03'.8	46'.6	32° 58'.4	44'.0
10	266° 59'.5	345° 45'.4	02'.1	306° 34'.6	36'.1	202° 06'.4	46'.6	48° 00'.7	44'.0
11	282° 02'.0	0° 44'.4	01'.9	321° 35'.1	35'.5	217° 09'.0	46'.6	63° 03'.1	44'.1
12	297° 04'.4	15° 43'.5	23° 01'.8 S	336° 35'.6	16° 34'.8 S	232° 11'.6	20° 46'.6 N	78° 05'.4	12° 44'.1 S
13	312° 06'.9	30° 42'.6	01'.6	351° 36'.1	34'.2	247° 14'.2	46'.5	93° 07'.7	44'.1
14	327° 09'.4	45° 41'.6	01'.5	6° 36'.6	33'.6	262° 16'.8	46'.5	108° 10'.1	44'.2
15	342° 11'.8	60° 40'.7	01'.4	21° 37'.1	33'.0	277° 19'.3	46'.5	123° 12'.4	44'.2
16	357° 14'.3	75° 39'.7	01'.2	36° 37'.6	32'.4	292° 21'.9	46'.5	138° 14'.7	44'.2
17	12° 16'.8	90° 38'.8	01'.1	51° 38'.2	31'.8	307° 24'.5	46'.5	153° 17'.1	44'.3
18	27° 19'.2	105° 37'.9	00'.9	66° 38'.7	31'.2	322° 27'.1	46'.5	168° 19'.4	44'.3
19	42° 21'.7	120° 36'.9	00'.8	81° 39'.2	30'.5	337° 29'.7	46'.5	183° 21'.7	44'.3
20	57° 24'.2	135° 36'.0	00'.6	96° 39'.7	29'.9	352° 32'.2	46'.5	198° 24'.0	44'.4
21	72° 26'.6	150° 35'.1	00'.5	111° 40'.2	29'.3	7° 34'.8	46'.5	213° 26'.4	44'.4
22	87° 29'.1	165° 34'.1	00'.3	126° 40'.7	28'.7	22° 37'.4	46'.5	228° 28'.7	44'.4
23	102° 31'.6	180° 33'.2	00'.2	141° 41'.2	28'.1	37° 40'.0	46'.5	243° 31'.0	44'.4
18 Friday 00	117° 34'.0	195° 32'.2	23° 00'.0 S	156° 41'.7	16° 27'.4 S	52° 42'.6	20° 46'.4 N	258° 33'.4	12° 44'.5 S
01	132° 36'.5	210° 31'.3	22° 59'.9 S	171° 42'.2	26'.8	67° 45'.1	46'.4	273° 35'.7	44'.5
02	147° 38'.9	225° 30'.4	59'.7	186° 42'.7	26'.2	82° 47'.7	46'.4	288° 38'.0	44'.5
03	162° 41'.4	240° 29'.4	59'.6	201° 43'.2	25'.6	97° 50'.3	46'.4	303° 40'.4	44'.6
04	177° 43'.9	255° 28'.5	59'.4	216° 43'.7	25'.0	112° 52'.9	46'.4	318° 42'.7	44'.6
05	192° 46'.3	270° 27'.6	59'.2	231° 44'.3	24'.3	127° 55'.4	46'.4	333° 45'.0	44'.6
06	207° 48'.8	285° 26'.6	59'.1	246° 44'.8	23'.7	142° 58'.0	46'.4	348° 47'.4	44'.7
07	222° 51'.3	300° 25'.7	58'.9	261° 45'.3	23'.1	158° 00'.6	46'.4	3° 49'.7	44'.7
08	237° 53'.7	315° 24'.7	58'.7	276° 45'.8	22'.5	173° 03'.2	46'.4	18° 52'.0	44'.7
09	252° 56'.2	330° 23'.8	58'.6	291° 46'.3	21'.9	188° 05'.7	46'.4	33° 54'.4	44'.8
10	267° 58'.7	345° 22'.9	58'.4	306° 46'.8	21'.2	203° 08'.3	46'.4	48° 56'.7	44'.8
11	283° 01'.1	0° 21'.9	58'.3	321° 47'.3	20'.6	218° 10'.9	46'.4	63° 59'.0	44'.8
12	298° 03'.6	15° 21'.0	22° 58'.1 S	336° 47'.8	16° 20'.0 S	233° 13'.5	20° 46'.3 N	79° 01'.4	12° 44'.9 S
13	313° 06'.1	30° 20'.1	57'.9	351° 48'.3	19'.4	248° 16'.0	46'.3	94° 03'.7	44'.9
14	328° 08'.5	45° 19'.1	57'.7	6° 48'.8	18'.8	263° 18'.6	46'.3	109° 06'.0	44'.9
15	343° 11'.0	60° 18'.2	57'.6	21° 49'.4	18'.1	278° 21'.2	46'.3	124° 08'.4	45'.0
16	358° 13'.4	75° 17'.3	57'.4	36° 49'.9	17'.5	293° 23'.7	46'.3	139° 10'.7	45'.0
17	13° 15'.9	90° 16'.3	57'.2	51° 50'.4	16'.9	308° 26'.3	46'.3	154° 13'.0	45'.0
18	28° 18'.4	105° 15'.4	57'.0	66° 50'.9	16'.3	323° 28'.9	46'.3	169° 15'.4	45'.1
19	43° 20'.8	120° 14'.5	56'.9	81° 51'.4	15'.6	338° 31'.5	46'.3	184° 17'.7	45'.1
20	58° 23'.3	135° 13'.5	56'.7	96° 51'.9	15'.0	353° 34'.0	46'.3	199° 20'.0	45'.1
21	73° 25'.8	150° 12'.6	56'.5	111° 52'.4	14'.4	8° 36'.6	46'.3	214° 22'.4	45'.1
22	88° 28'.2	165° 11'.7	56'.3	126° 52'.9	13'.8	23° 39'.2	46'.3	229° 24'.7	45'.2
23	103° 30'.7	180° 10'.7	56'.2	141° 53'.4	13'.1	38° 41'.7	46'.3	244° 27'.0	45'.2
	M.P. 16:11	v -0'.9	d 0'.1	v 0'.5	d 0'.6	v 2'.6	d 0'.0	v 2'.3	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.4	40° 15'.4 S
Achernar	335° 27'.0	57° 10'.5 S
Acrux	173° 09'.3	63° 10'.1 S
Adhara	255° 12'.3	28° 59'.6 S
Aldebaran	290° 49'.4	16° 32'.0 N
Alioth	166° 20'.8	55° 53'.0 N
Alkaid	152° 59'.1	49° 14'.6 N
Alnair	27° 44'.5	46° 53'.9 S
Alnilam	275° 46'.3	1° 11'.8 S
Alphard	217° 56'.0	8° 43'.1 S
Alphecca	126° 11'.4	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.9 N
Altair	62° 08'.8	8° 54'.3 N
Ankaa	353° 16'.1	42° 14'.3 S
Antares	112° 26'.8	26° 27'.5 S
Arcturus	145° 56'.0	19° 06'.7 N
Atria	107° 29'.3	69° 02'.7 S
Avior	234° 17'.4	59° 33'.2 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.7	52° 42'.4 S
Capella	280° 34'.4	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.8 N
Denebola	182° 33'.8	14° 29'.7 N
Diphda	348° 56'.2	17° 55'.0 S
Dubhe	193° 51'.6	61° 40'.4 N
Elnath	278° 12'.6	28° 37'.0 N
Eltanin	90° 46'.7	51° 29'.2 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.5	29° 33'.2 S
Gacrux	172° 01'.0	57° 11'.0 S
Gienah	175° 52'.4	17° 36'.9 S
Hadar	148° 48'.3	60° 25'.9 S
Hamal	328° 01'.0	23° 31'.5 N
Kaus Aust.	83° 44'.5	34° 22'.5 S
Kochab	137° 20'.4	74° 05'.8 N
Markab	13° 38'.8	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.4 N
Menkent	148° 07'.9	36° 25'.9 S
Miaplacidus	221° 38'.8	69° 46'.3 S
Mirfak	308° 40'.5	49° 54'.6 N
Nunki	75° 59'.0	26° 16'.7 S
Peacock	53° 20'.3	56° 41'.5 S
Polaris	317° 45'.3	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 07'.0	12° 33'.1 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.0	8° 11'.4 S
Rigil Kent	139° 52'.2	60° 53'.0 S
Sabik	102° 13'.1	15° 44'.3 S
Schedar	349° 40'.9	56° 36'.8 N
Shaula	96° 22'.6	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.3 S
Spica	158° 31'.5	11° 13'.8 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.5	38° 47'.8 N
Zuben'ubi	137° 05'.8	16° 05'.7 S

	SHA	Mer.Pass.
Venus	79° 19'.9	10:57
Mars	39° 54'.7	13:34
Jupiter	295° 05'.7	20:30
Saturn	141° 02'.6	06:48

	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
16 00	177° 34'.8	20° 56'.5 S	125° 28'.9	12'.5	0° 39'.5 N	11'.7	57'.4
01	192° 34'.6	56'.0	140° 00'.4	12'.5	51'.2	11'.8	57'.3
02	207° 34'.4	55'.5	154° 31'.9	12'.6	1° 03'.0 N	11'.7	
03	222° 34'.2	55'.1	169° 03'.5	12'.6	14'.7	11'.7	57'.2
04	237° 34'.0	54'.6	183° 35'.1	12'.6	26'.4	11'.7	
05	252° 33'.8	54'.1	198° 06'.7	12'.7	38'.1	11'.7	
06	267° 33'.6	53'.6	212° 38'.4	12'.7	49'.8	11'.6	57'.1
07	282° 33'.3	53'.1	227° 10'.1	12'.7	2° 01'.4 N	11'.6	
08	297° 33'.1	52'.7	241° 41'.8	12'.8	13'.0	11'.6	
09	312° 32'.9	52'.2	256° 13'.6	12'.8	24'.6	11'.6	57'.0
10	327° 32'.7	51'.7	270° 45'.4	12'.8	36'.2	11'.5	
11	342° 32'.5	51'.2	285° 17'.2	12'.9	47'.7	11'.5	56'.9
12	357° 32'.3	20° 50'.7 S	299° 49'.1	12'.9	2° 59'.2 N	11'.5	56'.9
13	12° 32'.1	50'.2	314° 21'.0	13'.0	3° 10'.7 N	11'.4	
14	27° 31'.9	49'.8	328° 53'.0	12'.9	22'.1	11'.4	56'.8
15	42° 31'.7	49'.3	343° 24'.9	13'.0	33'.5	11'.4	
16	57° 31'.4	48'.8	357° 56'.9	13'.0	44'.9	11'.3	
17	72° 31'.2	48'.3	12° 28'.9	13'.1	56'.2	11'.3	56'.7
18	87° 31'.0	47'.8	27° 01'.0	13'.1	4° 07'.5 N	11'.3	
19	102° 30'.8	47'.3	41° 33'.1	13'.1	18'.8	11'.2	56'.6
20	117° 30'.6	46'.8	56° 05'.2	13'.1	30'.0	11'.2	
21	132° 30'.4	46'.3	70° 37'.3	13'.1	41'.2	11'.2	
22	147° 30'.2	45'.9	85° 09'.4	13'.2	52'.4	11'.1	56'.5
23	162° 30'.0	45'.4	99° 41'.6	13'.2	5° 03'.5 N	11'.1	
17 00	177° 29'.8	20° 44'.9 S	114° 13'.8	13'.2	5° 14'.6 N	11'.1	56'.5
01	192° 29'.6	44'.4	128° 46'.0	13'.3	25'.7	11'.0	56'.4
02	207° 29'.4	43'.9	143° 18'.3	13'.2	36'.7	10'.9	
03	222° 29'.2	43'.4	157° 50'.5	13'.3	47'.6	11'.0	
04	237° 29'.0	42'.9	172° 22'.8	13'.3	58'.6	10'.9	56'.3
05	252° 28'.7	42'.4	186° 55'.1	13'.3	6° 09'.5 N	10'.8	
06	267° 28'.5	41'.9	201° 27'.4	13'.3	20'.3	10'.8	
07	282° 28'.3	41'.4	215° 59'.7	13'.4	31'.1	10'.8	56'.2
08	297° 28'.1	40'.9	230° 32'.1	13'.3	41'.9	10'.7	
09	312° 27'.9	40'.4	245° 04'.4	13'.4	52'.6	10'.7	
10	327° 27'.7	39'.9	259° 36'.8	13'.4	7° 03'.3 N	10'.6	56'.1
11	342° 27'.5	39'.4	274° 09'.2	13'.4	13'.9	10'.6	
12	357° 27'.3	20° 38'.9 S	288° 41'.6	13'.4	7° 24'.5 N	10'.5	56'.1
13	12° 27'.1	38'.4	303° 14'.0	13'.4	35'.0	10'.5	56'.0
14	27° 26'.9	37'.9	317° 46'.4	13'.5	45'.5	10'.4	
15	42° 26'.7	37'.4	332° 18'.9	13'.4	55'.9	10'.4	
16	57° 26'.5	36'.9	346° 51'.3	13'.5	8° 06'.3 N	10'.3	55'.9
17	72° 26'.3	36'.4	1° 23'.8	13'.4	16'.6	10'.3	
18	87° 26'.1	35'.9	15° 56'.2	13'.5	26'.9	10'.3	
19	102° 25'.9	35'.4	30° 28'.7	13'.5	37'.2	10'.2	55'.8
20	117° 25'.7	34'.9	45° 01'.2	13'.5	47'.4	10'.1	
21	132° 25'.5	34'.4	59° 33'.7	13'.5	57'.5	10'.1	
22	147° 25'.3	33'.9	74° 06'.2	13'.5	9° 07'.6 N	10'.0	55'.7
23	162° 25'.1	33'.4	88° 38'.7	13'.5	17'.6	10'.0	
18 00	177° 24'.9	20° 32'.9 S	103° 11'.2	13'.5	9° 27'.6 N	9'.9	55'.7
01	192° 24'.7	32'.4	117° 43'.7	13'.5	37'.5	9'.9	
02	207° 24'.5	31'.8	132° 16'.2	13'.5	47'.4	9'.8	55'.6
03	222° 24'.3	31'.3	146° 48'.7	13'.5	57'.2	9'.8	
04	237° 24'.1	30'.8	161° 21'.2	13'.6	10° 07'.0 N	9'.7	
05	252° 23'.9	30'.3	175° 53'.8	13'.5	16'.7	9'.7	55'.5
06	267° 23'.7	29'.8	190° 26'.3	13'.5	26'.4	9'.6	
07	282° 23'.5	29'.3	204° 58'.8	13'.5	36'.0	9'.5	
08	297° 23'.3	28'.8	219° 31'.3	13'.5	45'.5	9'.5	
09	312° 23'.1	28'.3	234° 03'.8	13'.6	55'.0	9'.4	55'.4
10	327° 22'.9	27'.7	248° 36'.4	13'.5	11° 04'.4 N	9'.4	
11	342° 22'.7	27'.2	263° 08'.9	13'.5	13'.8	9'.3	
12	357° 22'.5	20° 26'.7 S	277° 41'.4	13'.5	11° 23'.1 N	9'.2	55'.3
13	12° 22'.3	26'.2	292° 13'.9	13'.5	32'.3	9'.2	
14	27° 22'.1	25'.7	306° 46'.4	13'.5	41'.5	9'.1	
15	42° 21'.9	25'.2	321° 18'.9	13'.5	50'.6	9'.1	
16	57° 21'.8	24'.6	335° 51'.4	13'.5	59'.7	9'.0	55'.2
17	72° 21'.6	24'.1	350° 23'.9	13'.5	12° 08'.7 N	8'.9	
18	87° 21'.4	23'.6	4° 56'.4	13'.5	17'.6	8'.9	
19	102° 21'.2	23'.1	19° 28'.9	13'.4	26'.5	8'.8	
20	117° 21'.0	22'.6	34° 01'.3	13'.5	35'.3	8'.8	55'.1
21	132° 20'.8	22'.0	48° 33'.8	13'.5	44'.1	8'.7	
22	147° 20'.6	21'.5	63° 06'.3	13'.4	52'.8	8'.6	
23	162° 20'.4	21'.0	77° 38'.7	13'.5	13° 01'.4 N	8'.6	
	SD 16'.3	d 0'.5	SD	15'.5	15'.3	15'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18
N 72°	07:55	09:42	-	09:27	09:14	09:00
N 70°	07:41	09:11	11:38	09:30	09:24	09:17
68°	07:30	08:48	10:23	09:32	09:32	09:31
66°	07:20	08:30	09:46	09:35	09:38	09:42
64°	07:12	08:15	09:20	09:37	09:44	09:52
62°	07:05	08:03	09:00	09:38	09:49	10:00
60°	06:59	07:52	08:44	09:40	09:53	10:07
N 58°	06:53	07:43	08:30	09:41	09:57	10:14
56°	06:48	07:35	08:19	09:42	10:00	10:19
54°	06:43	07:27	08:08	09:43	10:03	10:24
52°	06:38	07:20	07:59	09:44	10:06	10:29
50°	06:34	07:14	07:51	09:45	10:08	10:33
45°	06:25	07:01	07:33	09:47	10:14	10:42
N 40°	06:16	06:50	07:19	09:49	10:19	10:49
35°	06:09	06:40	07:07	09:50	10:23	10:56
30°	06:01	06:31	06:56	09:51	10:26	11:02
20°	05:47	06:14	06:38	09:54	10:33	11:12
N 10°	05:33	05:59	06:22	09:56	10:38	11:20
0°	05:19	05:44	06:07	09:57	10:43	11:29
S 10°	05:02	05:29	05:51	09:59	10:49	11:37
20°	04:42	05:11	05:35	10:01	10:54	11:46
30°	04:17	04:49	05:15	10:04	11:01	11:56
35°	04:00	04:35	05:04	10:05	11:05	12:02
40°	03:40	04:20	04:51	10:07	11:09	12:09
45°	03:15	04:00	04:36	10:08	11:14	12:17
S 50°	02:39	03:35	04:17	10:11	11:20	12:27
52°	02:19	03:23	04:08	10:12	11:23	12:31
54°	01:54	03:09	03:57	10:13	11:26	12:36
56°	01:16	02:52	03:46	10:14	11:29	12:41
58°	-	02:31	03:32	10:15	11:33	12:48
S 60°	-	02:04	03:17	10:17	11:37	12:55
S 62°	-	01:23	02:58	10:19	11:42	13:03

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 16	Moonset 17	Moonset 18
N 72°	-	14:39	16:26	23:25	-	01:14
N 70°	12:43	15:10	16:40	23:17	-	00:59
68°	13:58	15:33	16:51	23:11	-	00:46
66°	14:35	15:51	17:01	23:06	-	00:36
64°	15:01	16:06	17:09	23:02	-	00:28
62°	15:21	16:18	17:16	22:58	-	00:20
60°	15:37	16:29	17:22	22:55	-	00:14
N 58°	15:50	16:38	17:28	22:53	-	00:09
56°	16:02	16:46	17:33	22:50	-	00:04
54°	16:13	16:54	17:38	22:48	23:59	25:09
52°	16:22	17:00	17:43	22:46	23:56	25:03
50°	16:30	17:07	17:47	22:44	23:52	24:58
45°	16:47	17:20	17:56	22:40	23:44	24:47
N 40°	17:02	17:31	18:04	22:37	23:38	24:37
35°	17:14	17:41	18:12	22:34	23:32	24:30
30°	17:24	17:50	18:19	22:31	23:28	24:23
20°	17:43	18:06	18:33	22:27	23:19	24:11
N 10°	17:59	18:21	18:47	22:23	23:12	24:00
0°	18:14	18:36	19:02	22:19	23:05	23:51
S 10°	18:29	18:52	19:18	22:16	22:58	23:41
20°	18:46	19:09	19:38	22:12	22:51	23:30
30°	19:05	19:31	20:03	22:08	22:43	23:19
35°	19:16	19:44	20:19	22:05	22:38	23:12
40°	19:29	20:00	20:39	22:02	22:33	23:04
45°	19:44	20:19	21:05	21:59	22:26	22:55
S 50°	20:03	20:44	21:40	21:55	22:19	22:44
52°	20:12	20:56	21:59	21:53	22:16	22:39
54°	20:22	21:10	22:24	21:51	22:12	22:34
56°	20:33	21:27	23:00	21:49	22:08	22:28
58°	20:47	21:47	-	21:47	22:03	22:21
S 60°	21:02	22:14	-	21:44	21:58	22:14
S 62°	21:21	22:53	-	21:41	21:52	22:05

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
16	9 40	9 50	12:10	16:08	03:45	5d 26%
17	10 00	10 10	12:10	16:54	04:31	6d 36%
18	10 20	10 29	12:10	17:40	05:17	7d 45%

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2013 January 19, 20, 21 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
19 Saturday 00	118° 33'.2	195° 09'.8	22° 56'.0 S	156° 54'.0	16° 12'.5 S	53° 44'.3	20° 46'.3 N	259° 29'.4	12° 45'.2 S
01	133° 35'.6	210° 08'.9	55'.8	171° 54'.5	11'.9	68° 46'.9	46'.3	274° 31'.7	45'.3
02	148° 38'.1	225° 07'.9	55'.6	186° 55'.0	11'.3	83° 49'.4	46'.2	289° 34'.0	45'.3
03	163° 40'.5	240° 07'.0	55'.4	201° 55'.5	10'.6	98° 52'.0	46'.2	304° 36'.4	45'.3
04	178° 43'.0	255° 06'.1	55'.2	216° 56'.0	10'.0	113° 54'.6	46'.2	319° 38'.7	45'.4
05	193° 45'.5	270° 05'.1	55'.0	231° 56'.5	09'.4	128° 57'.1	46'.2	334° 41'.0	45'.4
06	208° 47'.9	285° 04'.2	54'.8	246° 57'.0	08'.8	143° 59'.7	46'.2	349° 43'.4	45'.4
07	223° 50'.4	300° 03'.3	54'.7	261° 57'.6	08'.1	159° 02'.3	46'.2	4° 45'.7	45'.5
08	238° 52'.9	315° 02'.3	54'.5	276° 58'.1	07'.5	174° 04'.8	46'.2	19° 48'.0	45'.5
09	253° 55'.3	330° 01'.4	54'.3	291° 58'.6	06'.9	189° 07'.4	46'.2	34° 50'.4	45'.5
10	268° 57'.8	345° 00'.5	54'.1	306° 59'.1	06'.2	204° 10'.0	46'.2	49° 52'.7	45'.6
11	284° 00'.3	359° 59'.5	53'.9	321° 59'.6	05'.6	219° 12'.5	46'.2	64° 55'.1	45'.6
12	299° 02'.7	14° 58'.6	22° 53'.7 S	337° 00'.1	16° 05'.0 S	234° 15'.1	20° 46'.2 N	79° 57'.4	12° 45'.6 S
13	314° 05'.2	29° 57'.7	53'.5	352° 00'.6	04'.4	249° 17'.7	46'.2	94° 59'.7	45'.6
14	329° 07'.7	44° 56'.7	53'.3	7° 01'.2	03'.7	264° 20'.2	46'.2	110° 02'.1	45'.7
15	344° 10'.1	59° 55'.8	53'.1	22° 01'.7	03'.1	279° 22'.8	46'.2	125° 04'.4	45'.7
16	359° 12'.6	74° 54'.9	52'.9	37° 02'.2	02'.5	294° 25'.4	46'.2	140° 06'.7	45'.7
17	14° 15'.0	89° 53'.9	52'.7	52° 02'.7	01'.8	309° 27'.9	46'.2	155° 09'.1	45'.8
18	29° 17'.5	104° 53'.0	52'.5	67° 03'.2	01'.2	324° 30'.5	46'.1	170° 11'.4	45'.8
19	44° 20'.0	119° 52'.1	52'.3	82° 03'.7	00'.6	339° 33'.0	46'.1	185° 13'.8	45'.8
20	59° 22'.4	134° 51'.1	52'.1	97° 04'.3	15° 59'.9 S	354° 35'.6	46'.1	200° 16'.1	45'.9
21	74° 24'.9	149° 50'.2	51'.9	112° 04'.8	59'.3	9° 38'.2	46'.1	215° 18'.4	45'.9
22	89° 27'.4	164° 49'.3	51'.6	127° 05'.3	58'.7	24° 40'.7	46'.1	230° 20'.8	45'.9
23	104° 29'.8	179° 48'.4	51'.4	142° 05'.8	58'.0	39° 43'.3	46'.1	245° 23'.1	45'.9
20 Sunday 00	119° 32'.3	194° 47'.4	22° 51'.2 S	157° 06'.3	15° 57'.4 S	54° 45'.9	20° 46'.1 N	260° 25'.4	12° 46'.0 S
01	134° 34'.8	209° 46'.5	51'.0	172° 06'.8	56'.8	69° 48'.4	46'.1	275° 27'.8	46'.0
02	149° 37'.2	224° 45'.6	50'.8	187° 07'.4	56'.1	84° 51'.0	46'.1	290° 30'.1	46'.0
03	164° 39'.7	239° 44'.6	50'.6	202° 07'.9	55'.5	99° 53'.5	46'.1	305° 32'.5	46'.1
04	179° 42'.2	254° 43'.7	50'.4	217° 08'.4	54'.9	114° 56'.1	46'.1	320° 34'.8	46'.1
05	194° 44'.6	269° 42'.8	50'.1	232° 08'.9	54'.2	129° 58'.6	46'.1	335° 37'.1	46'.1
06	209° 47'.1	284° 41'.9	49'.9	247° 09'.4	53'.6	145° 01'.2	46'.1	350° 39'.5	46'.2
07	224° 49'.5	299° 40'.9	49'.7	262° 10'.0	53'.0	160° 03'.8	46'.1	5° 41'.8	46'.2
08	239° 52'.0	314° 40'.0	49'.5	277° 10'.5	52'.3	175° 06'.3	46'.1	20° 44'.2	46'.2
09	254° 54'.5	329° 39'.1	49'.3	292° 11'.0	51'.7	190° 08'.9	46'.1	35° 46'.5	46'.2
10	269° 56'.9	344° 38'.1	49'.0	307° 11'.5	51'.1	205° 11'.4	46'.1	50° 48'.8	46'.3
11	284° 59'.4	359° 37'.2	48'.8	322° 12'.0	50'.4	220° 14'.0	46'.1	65° 51'.2	46'.3
12	300° 01'.9	14° 36'.3	22° 48'.6 S	337° 12'.6	15° 49'.8 S	235° 16'.5	20° 46'.1 N	80° 53'.5	12° 46'.3 S
13	315° 04'.3	29° 35'.4	48'.4	352° 13'.1	49'.2	250° 19'.1	46'.0	95° 55'.9	46'.4
14	330° 06'.8	44° 34'.4	48'.1	7° 13'.6	48'.5	265° 21'.7	46'.0	110° 58'.2	46'.4
15	345° 09'.3	59° 33'.5	47'.9	22° 14'.1	47'.9	280° 24'.2	46'.0	126° 00'.5	46'.4
16	0° 11'.7	74° 32'.6	47'.7	37° 14'.6	47'.3	295° 26'.8	46'.0	141° 02'.9	46'.4
17	15° 14'.2	89° 31'.6	47'.4	52° 15'.2	46'.6	310° 29'.3	46'.0	156° 05'.2	46'.5
18	30° 16'.6	104° 30'.7	47'.2	67° 15'.7	46'.0	325° 31'.9	46'.0	171° 07'.6	46'.5
19	45° 19'.1	119° 29'.8	47'.0	82° 16'.2	45'.3	340° 34'.4	46'.0	186° 09'.9	46'.5
20	60° 21'.6	134° 28'.9	46'.7	97° 16'.7	44'.7	355° 37'.0	46'.0	201° 12'.3	46'.6
21	75° 24'.0	149° 27'.9	46'.5	112° 17'.2	44'.1	10° 39'.5	46'.0	216° 14'.6	46'.6
22	90° 26'.5	164° 27'.0	46'.3	127° 17'.8	43'.4	25° 42'.1	46'.0	231° 16'.9	46'.6
23	105° 29'.0	179° 26'.1	46'.0	142° 18'.3	42'.8	40° 44'.6	46'.0	246° 19'.3	46'.6
21 Monday 00	120° 31'.4	194° 25'.2	22° 45'.8 S	157° 18'.8	15° 42'.2 S	55° 47'.2	20° 46'.0 N	261° 21'.6	12° 46'.7 S
01	135° 33'.9	209° 24'.2	45'.5	172° 19'.3	41'.5	70° 49'.7	46'.0	276° 24'.0	46'.7
02	150° 36'.4	224° 23'.3	45'.3	187° 19'.9	40'.9	85° 52'.3	46'.0	291° 26'.3	46'.7
03	165° 38'.8	239° 22'.4	45'.0	202° 20'.4	40'.2	100° 54'.8	46'.0	306° 28'.7	46'.8
04	180° 41'.3	254° 21'.5	44'.8	217° 20'.9	39'.6	115° 57'.4	46'.0	321° 31'.0	46'.8
05	195° 43'.8	269° 20'.5	44'.5	232° 21'.4	39'.0	130° 59'.9	46'.0	336° 33'.3	46'.8
06	210° 46'.2	284° 19'.6	44'.3	247° 21'.9	38'.3	146° 02'.5	46'.0	351° 35'.7	46'.8
07	225° 48'.7	299° 18'.7	44'.0	262° 22'.5	37'.7	161° 05'.0	46'.0	6° 38'.0	46'.9
08	240° 51'.1	314° 17'.8	43'.8	277° 23'.0	37'.0	176° 07'.6	46'.0	21° 40'.4	46'.9
09	255° 53'.6	329° 16'.9	43'.5	292° 23'.5	36'.4	191° 10'.1	46'.0	36° 42'.7	46'.9
10	270° 56'.1	344° 15'.9	43'.3	307° 24'.0	35'.7	206° 12'.7	46'.0	51° 45'.1	47'.0
11	285° 58'.5	359° 15'.0	43'.0	322° 24'.6	35'.1	221° 15'.2	46'.0	66° 47'.4	47'.0
12	301° 01'.0	14° 14'.1	22° 42'.8 S	337° 25'.1	15° 34'.5 S	236° 17'.8	20° 46'.0 N	81° 49'.8	12° 47'.0 S
13	316° 03'.5	29° 13'.2	42'.5	352° 25'.6	33'.8	251° 20'.3	45'.9	96° 52'.1	47'.0
14	331° 05'.9	44° 12'.2	42'.3	7° 26'.1	33'.2	266° 22'.9	45'.9	111° 54'.4	47'.1
15	346° 08'.4	59° 11'.3	42'.0	22° 26'.7	32'.5	281° 25'.4	45'.9	126° 56'.8	47'.1
16	1° 10'.9	74° 10'.4	41'.7	37° 27'.2	31'.9	296° 28'.0	45'.9	141° 59'.1	47'.1
17	16° 13'.3	89° 09'.5	41'.5	52° 27'.7	31'.2	311° 30'.5	45'.9	157° 01'.5	47'.1
18	31° 15'.8	104° 08'.6	41'.2	67° 28'.2	30'.6	326° 33'.0	45'.9	172° 03'.8	47'.2
19	46° 18'.3	119° 07'.6	41'.0	82° 28'.8	30'.0	341° 35'.6	45'.9	187° 06'.2	47'.2
20	61° 20'.7	134° 06'.7	40'.7	97° 29'.3	29'.3	356° 38'.1	45'.9	202° 08'.5	47'.2
21	76° 23'.2	149° 05'.8	40'.4	112° 29'.8	28'.7	11° 40'.7	45'.9	217° 10'.9	47'.3
22	91° 25'.6	164° 04'.9	40'.2	127° 30'.3	28'.0	26° 43'.2	45'.9	232° 13'.2	47'.3
23	106° 28'.1	179° 04'.0	39'.9	142° 30'.9	27'.4	41° 45'.8	45'.9	247° 15'.6	47'.3
	M.P. 15:59	v -0'.9	d 0'.2	v 0'.5	d 0'.6	v 2'.6	d 0'.0	v 2'.3	d 0'.0

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 18'.4	40° 15'.4 S	177° 20'.2	20° 20'.5 S	92° 11'.2	13'.4	13° 10'.0 N	8'.4	55'.0
Achernar	335° 27'.0	57° 10'.5 S	192° 20'.0	19'.9	106° 43'.6	13'.4	18'.4	8'.5	
Acrux	173° 09'.3	63° 10'.1 S	207° 19'.8	19'.4	121° 16'.0	13'.4	26'.9	8'.3	
Adhara	255° 12'.3	28° 59'.7 S	222° 19'.6	18'.9	135° 48'.4	13'.4	35'.2	8'.3	
Aldebaran	290° 49'.4	16° 32'.0 N	237° 19'.4	18'.4	150° 20'.8	13'.4	43'.5	8'.3	
			252° 19'.3	17'.8	164° 53'.2	13'.4	51'.8	8'.1	54'.9
Alioth	166° 20'.8	55° 53'.0 N	267° 19'.1	17'.3	179° 25'.6	13'.4	59'.9	8'.1	
Alkaid	152° 59'.1	49° 14'.6 N	282° 18'.9	16'.8	193° 58'.0	13'.3	14° 08'.0 N	8'.0	
Alnair	27° 44'.5	46° 53'.9 S	297° 18'.7	16'.3	208° 30'.3	13'.4	16'.0	8'.0	
Alnilam	275° 46'.3	1° 11'.8 S	312° 18'.5	15'.7	223° 02'.7	13'.3	24'.0	7'.9	54'.8
Alphard	217° 56'.0	8° 43'.1 S	327° 18'.3	15'.2	237° 35'.0	13'.3	31'.9	7'.8	
			342° 18'.1	14'.7	252° 07'.3	13'.3	39'.7	7'.7	
Alphecca	126° 11'.4	26° 40'.1 N	357° 17'.9	20° 14'.1 S	266° 39'.6	13'.3	14° 47'.4 N	7'.7	54'.8
Alpheratz	357° 43'.9	29° 09'.9 N	12° 17'.7	13'.6	281° 11'.9	13'.3	55'.1	7'.6	
Altair	62° 08'.8	8° 54'.3 N	27° 17'.6	13'.1	295° 44'.2	13'.2	15° 02'.7 N	7'.5	54'.7
Ankaa	353° 16'.1	42° 14'.3 S	42° 17'.4	12'.5	310° 16'.4	13'.3	10'.2	7'.5	
Antares	112° 26'.8	26° 27'.5 S	57° 17'.2	12'.0	324° 48'.7	13'.2	17'.7	7'.4	
			72° 17'.0	11'.5	339° 20'.9	13'.2	25'.1	7'.3	
Arcturus	145° 56'.0	19° 06'.7 N	87° 16'.8	10'.9	353° 53'.1	13'.2	32'.4	7'.2	
Atria	107° 29'.2	69° 02'.7 S	102° 16'.6	10'.4	8° 25'.3	13'.2	39'.6	7'.2	
Avior	234° 17'.4	59° 33'.2 S	117° 16'.4	09'.8	22° 57'.5	13'.1	46'.8	7'.1	54'.6
Bellatrix	278° 32'.0	6° 21'.5 N	132° 16'.3	09'.3	37° 29'.6	13'.2	53'.9	7'.0	
Betelgeuse	271° 01'.3	7° 24'.4 N	147° 16'.1	08'.8	52° 01'.8	13'.1	16° 00'.9 N	6'.9	
			162° 15'.9	08'.2	66° 33'.9	13'.1	07'.8	6'.9	
Canopus	263° 55'.7	52° 42'.4 S	177° 15'.7	20° 07'.7 S	81° 06'.0	13'.1	16° 14'.7 N	6'.8	54'.6
Capella	280° 34'.4	46° 00'.6 N	192° 15'.5	07'.2	95° 38'.1	13'.1	21'.5	6'.7	
Deneb	49° 32'.1	45° 19'.8 N	207° 15'.3	06'.6	110° 10'.2	13'.0	28'.2	6'.6	54'.5
Denebola	182° 33'.7	14° 29'.7 N	222° 15'.2	06'.1	124° 42'.2	13'.1	34'.8	6'.6	
Diphda	348° 56'.3	17° 55'.0 S	237° 15'.0	05'.5	139° 14'.3	13'.0	41'.4	6'.5	
			252° 14'.8	05'.0	153° 46'.3	13'.0	47'.9	6'.4	
Dubhe	193° 51'.6	61° 40'.4 N	267° 14'.6	04'.4	168° 18'.3	13'.0	54'.3	6'.3	
Elnath	278° 12'.6	28° 37'.0 N	282° 14'.4	03'.9	182° 50'.3	12'.9	17° 00'.6 N	6'.3	
Eltanin	90° 46'.7	51° 29'.2 N	297° 14'.2	03'.3	197° 22'.2	13'.0	06'.9	6'.1	54'.4
Enif	33° 47'.7	9° 56'.2 N	312° 14'.1	02'.8	211° 54'.2	12'.9	13'.0	6'.1	
Fomalhaut	15° 24'.5	29° 33'.2 S	327° 13'.9	02'.3	226° 26'.1	12'.9	19'.1	6'.0	
			342° 13'.7	01'.7	240° 58'.0	12'.9	25'.1	6'.0	
Gacrux	172° 00'.9	57° 11'.0 S	357° 13'.5	20° 01'.2 S	255° 29'.9	12'.8	17° 31'.1 N	5'.8	54'.4
Gienah	175° 52'.4	17° 36'.9 S	12° 13'.3	00'.6	270° 01'.7	12'.9	36'.9	5'.8	
Hadar	148° 48'.2	60° 25'.9 S	27° 13'.2	00'.1	284° 33'.6	12'.8	42'.7	5'.7	
Hamal	328° 01'.0	23° 31'.5 N	42° 13'.0	19° 59'.5 S	299° 05'.4	12'.8	48'.4	5'.6	
Kaus Aust.	83° 44'.5	34° 22'.5 S	57° 12'.8	59'.0	313° 37'.2	12'.7	54'.0	5'.5	54'.3
			72° 12'.6	58'.4	328° 08'.9	12'.8	59'.5	5'.4	
Kochab	137° 20'.4	74° 05'.8 N	87° 12'.5	57'.9	342° 40'.7	12'.7	18° 04'.9 N	5'.4	
Markab	13° 38'.8	15° 16'.7 N	102° 12'.3	57'.3	357° 12'.4	12'.8	10'.3	5'.3	
Menkar	314° 15'.2	4° 08'.4 N	117° 12'.1	56'.8	11° 44'.2	12'.7	15'.6	5'.2	
Menkent	148° 07'.9	36° 25'.9 S	132° 11'.9	56'.2	26° 15'.9	12'.6	20'.8	5'.1	
Miaplacidus	221° 38'.8	69° 46'.3 S	147° 11'.7	55'.6	40° 47'.5	12'.7	25'.9	5'.0	
			162° 11'.6	55'.1	55° 19'.2	12'.6	30'.9	4'.9	
Mirfak	308° 40'.5	49° 54'.6 N	177° 11'.4	19° 54'.5 S	69° 50'.8	12'.6	18° 35'.8 N	4'.9	54'.3
Nunki	75° 59'.0	26° 16'.7 S	192° 11'.2	54'.0	84° 22'.4	12'.6	40'.7	4'.8	
Peacock	53° 20'.3	56° 41'.5 S	207° 11'.0	53'.4	98° 54'.0	12'.6	45'.5	4'.6	54'.2
Polaris	317° 46'.5	89° 19'.5 N	222° 10'.9	52'.9	113° 25'.6	12'.5	50'.1	4'.6	
Pollux	243° 27'.7	27° 59'.4 N	237° 10'.7	52'.3	127° 57'.1	12'.6	54'.7	4'.5	
			252° 10'.5	51'.8	142° 28'.7	12'.5	59'.2	4'.5	
Procyon	244° 59'.7	5° 11'.2 N	267° 10'.3	51'.2	157° 00'.2	12'.5	19° 03'.7 N	4'.3	
Rasalhague	96° 07'.0	12° 33'.1 N	282° 10'.2	50'.6	171° 31'.7	12'.4	08'.0	4'.3	
Regulus	207° 43'.5	11° 53'.9 N	297° 10'.0	50'.1	186° 03'.1	12'.5	12'.3	4'.1	
Rigel	281° 12'.0	8° 11'.4 S	312° 09'.8	49'.5	200° 34'.6	12'.4	16'.4	4'.1	
Rigil Kent	139° 52'.1	60° 53'.0 S	327° 09'.7	48'.9	215° 06'.0	12'.4	20'.5	4'.0	
			342° 09'.5	48'.4	229° 37'.4	12'.4	24'.5	3'.9	
Sabik	102° 13'.1	15° 44'.3 S	357° 09'.3	19° 47'.8 S	244° 08'.8	12'.4	19° 28'.4 N	3'.8	54'.2
Schedar	349° 41'.0	56° 36'.8 N	12° 09'.1	47'.3	258° 40'.2	12'.3	32'.2	3'.7	
Shaula	96° 22'.6	37° 06'.6 S	27° 09'.0	46'.7	273° 11'.5	12'.3	35'.9	3'.7	
Sirius	258° 33'.6	16° 44'.3 S	42° 08'.8	46'.1	287° 42'.8	12'.3	39'.6	3'.5	
Spica	158° 31'.5	11° 13'.8 S	57° 08'.6	45'.6	302° 14'.1	12'.3	43'.1	3'.5	54'.1
			72° 08'.5	45'.0	316° 45'.4	12'.3	46'.6	3'.3	
Suhail	222° 52'.2	43° 29'.3 S	87° 08'.3	44'.4	331° 16'.7	12'.2	49'.9	3'.3	
Vega	80° 39'.5	38° 47'.8 N	102° 08'.1	43'.9	345° 47'.9	12'.3	53'.2	3'.2	
Zuben'ubi	137° 05'.8	16° 05'.7 S	117° 07'.9	43'.3	0° 19'.2	12'.2	56'.4	3'.1	
	SHA	Mer.Pass.	132° 07'.8	42'.7	14° 50'.4	12'.2	59'.5	3'.0	
Venus	75° 15'.1	11:02	147° 07'.6	42'.2	29° 21'.6	12'.1	20° 02'.5 N	2'.9	
Mars	37° 34'.0	13:31	162° 07'.4	41'.6	43° 52'.7	12'.2	05'.4	2'.8	
Jupiter	295° 13'.6	20:17							
Saturn	140° 53'.2	06:37	SD 16'.3	d 0'.5	SD	14'.9	14'.8	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21
N 72°	07:47	09:30	-	08:41	08:09	-
N 70°	07:34	09:02	11:03	09:10	09:01	08:46
68°	07:24	08:40	10:09	09:31	09:34	09:40
66°	07:15	08:23	09:37	09:48	09:58	10:13
64°	07:08	08:10	09:13	10:02	10:17	10:37
62°	07:01	07:58	08:54	10:14	10:32	10:57
60°	06:55	07:48	08:39	10:24	10:45	11:12
N 58°	06:49	07:39	08:26	10:33	10:56	11:26
56°	06:45	07:31	08:15	10:41	11:06	11:37
54°	06:40	07:24	08:05	10:48	11:15	11:47
52°	06:36	07:18	07:56	10:54	11:23	11:56
50°	06:32	07:12	07:48	10:59	11:30	12:04
45°	06:23	06:59	07:31	11:12	11:45	12:22
N 40°	06:15	06:48	07:18	11:22	11:57	12:36
35°	06:08	06:39	07:06	11:31	12:08	12:48
30°	06:01	06:30	06:56	11:38	12:17	12:58
20°	05:47	06:14	06:38	11:52	12:33	13:17
N 10°	05:34	06:00	06:22	12:03	12:47	13:32
0°	05:20	05:45	06:07	12:14	13:00	13:47
S 10°	05:04	05:30	05:53	12:25	13:14	14:02
20°	04:44	05:13	05:37	12:37	13:28	14:18
30°	04:20	04:52	05:18	12:51	13:44	14:36
35°	04:04	04:39	05:07	12:59	13:54	14:47
40°	03:45	04:23	04:55	13:08	14:05	14:59
45°	03:20	04:05	04:40	13:18	14:18	15:14
S 50°	02:46	03:41	04:21	13:31	14:33	15:32
52°	02:27	03:29	04:13	13:37	14:41	15:40
54°	02:04	03:16	04:03	13:44	14:49	15:50
56°	01:31	03:00	03:52	13:51	14:58	16:00
58°	-	02:40	03:39	14:00	15:09	16:12
S 60°	-	02:15	03:24	14:09	15:21	16:27
S 62°	-	01:40	03:06	14:21	15:35	16:44

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 19	Moonset 20	Moonset 21
N 72°	-	14:53	16:36	03:08	05:16	-
N 70°	13:20	15:22	16:49	02:40	04:25	06:16
68°	14:14	15:43	16:59	02:20	03:53	05:23
66°	14:46	16:00	17:08	02:04	03:29	04:51
64°	15:10	16:13	17:16	01:51	03:11	04:27
62°	15:29	16:25	17:22	01:40	02:56	04:08
60°	15:44	16:35	17:28	01:30	02:44	03:53
N 58°	15:57	16:44	17:33	01:22	02:33	03:39
56°	16:08	16:52	17:38	01:15	02:24	03:28
54°	16:18	16:59	17:43	01:09	02:15	03:18
52°	16:27	17:05	17:47	01:03	02:08	03:10
50°	16:35	17:11	17:51	00:58	02:01	03:02
45°	16:51	17:24	18:00	00:47	01:47	02:45
N 40°	17:05	17:34	18:07	00:37	01:35	02:31
35°	17:17	17:44	18:15	00:30	01:25	02:20
30°	17:27	17:53	18:22	00:23	01:17	02:10
20°	17:45	18:08	18:35	00:11	01:02	01:52
N 10°	18:00	18:22	18:48	00:00	00:49	01:37
0°	18:15	18:37	19:02	-	00:36	01:23
S 10°	18:29	18:52	19:18	-	00:24	01:09
20°	18:45	19:09	19:37	-	00:11	00:54
30°	19:04	19:30	20:02	23:56	-	00:36
35°	19:15	19:43	20:18	23:48	-	00:26
40°	19:27	19:58	20:37	23:38	-	00:15
45°	19:42	20:17	21:01	23:27	-	00:01
S 50°	20:00	20:40	21:35	23:13	23:45	24:23
52°	20:08	20:52	21:53	23:06	23:37	24:14
54°	20:18	21:05	22:15	22:59	23:29	24:05
56°	20:29	21:21	22:47	22:51	23:19	23:54
58°	20:41	21:40	23:53	22:42	23:08	23:41
S 60°	20:56	22:04	-	22:32	22:56	23:27
S 62°	21:14	22:38	-	22:20	22:41	23:10

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
19	10 39	10 48	12:11	18:25	06:02	8d 55%
20	10 57	11 06	12:11	19:12	06:48	9d 64%
21	11 14	11 22	12:11	19:59	07:35	10d 73%

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2013 January 22, 23, 24 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
22 Tuesday 00	121° 30'.6	194° 03'.0	22° 39'.6 S	157° 31'.4	15° 26'.7 S	56° 48'.3	20° 45'.9 N	262° 17'.9	12° 47'.3 S
01	136° 33'.0	209° 02'.1	39'.3	172° 31'.9	26'.1	71° 50'.8	45'.9	277° 20'.2	47'.4
02	151° 35'.5	224° 01'.2	39'.1	187° 32'.5	25'.4	86° 53'.4	45'.9	292° 22'.6	47'.4
03	166° 38'.0	239° 00'.3	38'.8	202° 33'.0	24'.8	101° 55'.9	45'.9	307° 24'.9	47'.4
04	181° 40'.4	253° 59'.4	38'.5	217° 33'.5	24'.1	116° 58'.5	45'.9	322° 27'.3	47'.5
05	196° 42'.9	268° 58'.4	38'.3	232° 34'.0	23'.5	132° 01'.0	45'.9	337° 29'.6	47'.5
06	211° 45'.4	283° 57'.5	38'.0	247° 34'.6	22'.8	147° 03'.5	45'.9	352° 32'.0	47'.5
07	226° 47'.8	298° 56'.6	37'.7	262° 35'.1	22'.2	162° 06'.1	45'.9	7° 34'.3	47'.5
08	241° 50'.3	313° 55'.7	37'.4	277° 35'.6	21'.6	177° 08'.6	45'.9	22° 36'.7	47'.6
09	256° 52'.8	328° 54'.8	37'.1	292° 36'.1	20'.9	192° 11'.2	45'.9	37° 39'.0	47'.6
10	271° 55'.2	343° 53'.8	36'.9	307° 36'.7	20'.3	207° 13'.7	45'.9	52° 41'.4	47'.6
11	286° 57'.7	358° 52'.9	36'.6	322° 37'.2	19'.6	222° 16'.2	45'.9	67° 43'.7	47'.6
12	302° 00'.1	13° 52'.0	22° 36'.3 S	337° 37'.7	15° 19'.0 S	237° 18'.8	20° 45'.9 N	82° 46'.1	12° 47'.7 S
13	317° 02'.6	28° 51'.1	36'.0	352° 38'.3	18'.3	252° 21'.3	45'.9	97° 48'.4	47'.7
14	332° 05'.1	43° 50'.2	35'.7	7° 38'.8	17'.7	267° 23'.9	45'.9	112° 50'.8	47'.7
15	347° 07'.5	58° 49'.3	35'.4	22° 39'.3	17'.0	282° 26'.4	45'.9	127° 53'.1	47'.7
16	2° 10'.0	73° 48'.3	35'.1	37° 39'.9	16'.4	297° 28'.9	45'.9	142° 55'.5	47'.8
17	17° 12'.5	88° 47'.4	34'.8	52° 40'.4	15'.7	312° 31'.5	45'.9	157° 57'.8	47'.8
18	32° 14'.9	103° 46'.5	34'.6	67° 40'.9	15'.1	327° 34'.0	45'.9	173° 00'.2	47'.8
19	47° 17'.4	118° 45'.6	34'.3	82° 41'.4	14'.4	342° 36'.5	45'.9	188° 02'.5	47'.8
20	62° 19'.9	133° 44'.7	34'.0	97° 42'.0	13'.8	357° 39'.1	45'.9	203° 04'.9	47'.9
21	77° 22'.3	148° 43'.8	33'.7	112° 42'.5	13'.1	12° 41'.6	45'.9	218° 07'.2	47'.9
22	92° 24'.8	163° 42'.9	33'.4	127° 43'.0	12'.5	27° 44'.1	45'.9	233° 09'.6	47'.9
23	107° 27'.2	178° 41'.9	33'.1	142° 43'.6	11'.8	42° 46'.7	45'.9	248° 11'.9	48'.0
23 Wednesday 00	122° 29'.7	193° 41'.0	22° 32'.8 S	157° 44'.1	15° 11'.1 S	57° 49'.2	20° 45'.9 N	263° 14'.3	12° 48'.0 S
01	137° 32'.2	208° 40'.1	32'.5	172° 44'.6	10'.5	72° 51'.7	45'.9	278° 16'.6	48'.0
02	152° 34'.6	223° 39'.2	32'.2	187° 45'.2	09'.8	87° 54'.3	45'.9	293° 19'.0	48'.0
03	167° 37'.1	238° 38'.3	31'.9	202° 45'.7	09'.2	102° 56'.8	45'.9	308° 21'.3	48'.1
04	182° 39'.6	253° 37'.4	31'.6	217° 46'.2	08'.5	117° 59'.3	45'.9	323° 23'.7	48'.1
05	197° 42'.0	268° 36'.5	31'.3	232° 46'.8	07'.9	133° 01'.9	45'.9	338° 26'.0	48'.1
06	212° 44'.5	283° 35'.5	31'.0	247° 47'.3	07'.2	148° 04'.4	45'.9	353° 28'.4	48'.1
07	227° 47'.0	298° 34'.6	30'.7	262° 47'.8	06'.6	163° 06'.9	45'.9	8° 30'.7	48'.2
08	242° 49'.4	313° 33'.7	30'.3	277° 48'.4	05'.9	178° 09'.5	45'.9	23° 33'.1	48'.2
09	257° 51'.9	328° 32'.8	30'.0	292° 48'.9	05'.3	193° 12'.0	45'.9	38° 35'.4	48'.2
10	272° 54'.4	343° 31'.9	29'.7	307° 49'.4	04'.6	208° 14'.5	45'.9	53° 37'.8	48'.2
11	287° 56'.8	358° 31'.0	29'.4	322° 50'.0	04'.0	223° 17'.0	45'.9	68° 40'.1	48'.3
12	302° 59'.3	13° 30'.1	22° 29'.1 S	337° 50'.5	15° 03'.3 S	238° 19'.6	20° 45'.9 N	83° 42'.5	12° 48'.3 S
13	318° 01'.7	28° 29'.2	28'.8	352° 51'.0	02'.6	253° 22'.1	45'.9	98° 44'.8	48'.3
14	333° 04'.2	43° 28'.3	28'.5	7° 51'.6	02'.0	268° 24'.6	45'.9	113° 47'.2	48'.3
15	348° 06'.7	58° 27'.3	28'.2	22° 52'.1	01'.3	283° 27'.2	45'.9	128° 49'.5	48'.4
16	3° 09'.1	73° 26'.4	27'.8	37° 52'.6	00'.7	298° 29'.7	45'.9	143° 51'.9	48'.4
17	18° 11'.6	88° 25'.5	27'.5	52° 53'.2	00'.0	313° 32'.2	45'.9	158° 54'.2	48'.4
18	33° 14'.1	103° 24'.6	27'.2	67° 53'.7	14° 59'.4 S	328° 34'.7	45'.9	173° 56'.6	48'.4
19	48° 16'.5	118° 23'.7	26'.9	82° 54'.2	58'.7	343° 37'.3	45'.9	188° 58'.9	48'.5
20	63° 19'.0	133° 22'.8	26'.5	97° 54'.8	58'.0	358° 39'.8	45'.9	204° 01'.3	48'.5
21	78° 21'.5	148° 21'.9	26'.2	112° 55'.3	57'.4	13° 42'.3	45'.9	219° 03'.6	48'.5
22	93° 23'.9	163° 21'.0	25'.9	127° 55'.8	56'.7	28° 44'.8	45'.9	234° 06'.0	48'.5
23	108° 26'.4	178° 20'.1	25'.6	142° 56'.4	56'.1	43° 47'.4	45'.9	249° 08'.4	48'.6
24 Thursday 00	123° 28'.9	193° 19'.2	22° 25'.2 S	157° 56'.9	14° 55'.4 S	58° 49'.9	20° 45'.9 N	264° 10'.7	12° 48'.6 S
01	138° 31'.3	208° 18'.3	24'.9	172° 57'.4	54'.8	73° 52'.4	45'.9	279° 13'.1	48'.6
02	153° 33'.8	223° 17'.4	24'.6	187° 58'.0	54'.1	88° 54'.9	45'.9	294° 15'.4	48'.6
03	168° 36'.2	238° 16'.4	24'.3	202° 58'.5	53'.4	103° 57'.5	45'.9	309° 17'.8	48'.7
04	183° 38'.7	253° 15'.5	23'.9	217° 59'.1	52'.8	119° 00'.0	45'.9	324° 20'.1	48'.7
05	198° 41'.2	268° 14'.6	23'.6	232° 59'.6	52'.1	134° 02'.5	45'.9	339° 22'.5	48'.7
06	213° 43'.6	283° 13'.7	23'.3	248° 00'.1	51'.5	149° 05'.0	45'.9	354° 24'.8	48'.7
07	228° 46'.1	298° 12'.8	22'.9	263° 00'.7	50'.8	164° 07'.5	45'.9	9° 27'.2	48'.8
08	243° 48'.6	313° 11'.9	22'.6	278° 01'.2	50'.1	179° 10'.1	45'.9	24° 29'.5	48'.8
09	258° 51'.0	328° 11'.0	22'.2	293° 01'.7	49'.5	194° 12'.6	45'.9	39° 31'.9	48'.8
10	273° 53'.5	343° 10'.1	21'.9	308° 02'.3	48'.8	209° 15'.1	45'.9	54° 34'.3	48'.8
11	288° 56'.0	358° 09'.2	21'.6	323° 02'.8	48'.2	224° 17'.6	45'.9	69° 36'.6	48'.9
12	303° 58'.4	13° 08'.3	22° 21'.2 S	338° 03'.4	14° 47'.5 S	239° 20'.1	20° 45'.9 N	84° 39'.0	12° 48'.9 S
13	319° 00'.9	28° 07'.4	20'.9	353° 03'.9	46'.8	254° 22'.7	45'.9	99° 41'.3	48'.9
14	334° 03'.4	43° 06'.5	20'.5	8° 04'.4	46'.2	269° 25'.2	45'.9	114° 43'.7	48'.9
15	349° 05'.8	58° 05'.6	20'.2	23° 05'.0	45'.5	284° 27'.7	45'.9	129° 46'.0	48'.9
16	4° 08'.3	73° 04'.7	19'.8	38° 05'.5	44'.8	299° 30'.2	45'.9	144° 48'.4	49'.0
17	19° 10'.7	88° 03'.8	19'.5	53° 06'.1	44'.2	314° 32'.7	45'.9	159° 50'.8	49'.0
18	34° 13'.2	103° 02'.9	19'.1	68° 06'.6	43'.5	329° 35'.3	45'.9	174° 53'.1	49'.0
19	49° 15'.7	118° 02'.0	18'.8	83° 07'.1	42'.9	344° 37'.8	45'.9	189° 55'.5	49'.0
20	64° 18'.1	133° 01'.1	18'.4	98° 07'.7	42'.2	359° 40'.3	45'.9	204° 57'.8	49'.1
21	79° 20'.6	148° 00'.2	18'.1	113° 08'.2	41'.5	14° 42'.8	45'.9	220° 00'.2	49'.1
22	94° 23'.1	162° 59'.3	17'.7	128° 08'.8	40'.9	29° 45'.3	45'.9	235° 02'.5	49'.1
23	109° 25'.5	177° 58'.4	17'.4	143° 09'.3	40'.2	44° 47'.8	45'.9	250° 04'.9	49'.1
	M.P. 15:47	v -0'.9	d 0'.3	v 0'.5	d 0'.7	v 2'.5	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.4	40° 15'.4 S
Achernar	335° 27'.1	57° 10'.5 S
Acrux	173° 09'.2	63° 10'.1 S
Adhara	255° 12'.3	28° 59'.7 S
Aldebaran	290° 49'.4	16° 32'.0 N
Alioth	166° 20'.8	55° 53'.0 N
Alkaid	152° 59'.1	49° 14'.6 N
Alnair	27° 44'.5	46° 53'.9 S
Alnilam	275° 46'.3	1° 11'.8 S
Alphard	217° 56'.0	8° 43'.1 S
Alphecca	126° 11'.4	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.9 N
Altair	62° 08'.8	8° 54'.3 N
Ankaa	353° 16'.2	42° 14'.3 S
Antares	112° 26'.8	26° 27'.5 S
Arcturus	145° 56'.0	19° 06'.7 N
Atria	107° 29'.2	69° 02'.7 S
Avior	234° 17'.4	59° 33'.3 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.7	52° 42'.5 S
Capella	280° 34'.4	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.8 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.5	61° 40'.5 N
Elnath	278° 12'.6	28° 37'.0 N
Eltanin	90° 46'.7	51° 29'.2 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.5	29° 33'.2 S
Gacrux	172° 00'.9	57° 11'.0 S
Gienah	175° 52'.4	17° 36'.9 S
Hadar	148° 48'.2	60° 25'.9 S
Hamal	328° 01'.0	23° 31'.5 N
Kaus Aust.	83° 44'.5	34° 22'.5 S
Kochab	137° 20'.3	74° 05'.8 N
Markab	13° 38'.8	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.4 N
Menkent	148° 07'.8	36° 25'.9 S
Miaplacidus	221° 38'.7	69° 46'.3 S
Mirfak	308° 40'.5	49° 54'.6 N
Nunki	75° 59'.0	26° 16'.7 S
Peacock	53° 20'.3	56° 41'.5 S
Polaris	317° 47'.7	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 07'.0	12° 33'.1 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.0	8° 11'.4 S
Rigil Kent	139° 52'.1	60° 53'.0 S
Sabik	102° 13'.1	15° 44'.3 S
Schedar	349° 41'.0	56° 36'.8 N
Shaula	96° 22'.6	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.3 S
Spica	158° 31'.4	11° 13'.8 S
Suhail	222° 52'.2	43° 29'.3 S
Vega	80° 39'.5	38° 47'.8 N
Zuben'ubi	137° 05'.8	16° 05'.7 S

	SHA	Mer.Pass.
Venus	71° 11'.3	11:06
Mars	35° 14'.4	13:29
Jupiter	295° 19'.5	20:05
Saturn	140° 44'.5	06:26

SUN	GHA	Dec
22 00	177° 07'.3	19° 41'.0 S
01	192° 07'.1	40'.4
02	207° 06'.9	39'.9
03	222° 06'.8	39'.3
04	237° 06'.6	38'.7
05	252° 06'.4	38'.1
06	267° 06'.3	37'.6
07	282° 06'.1	37'.0
08	297° 05'.9	36'.4
09	312° 05'.8	35'.8
10	327° 05'.6	35'.3
11	342° 05'.4	34'.7
12	357° 05'.3	19° 34'.1 S
13	12° 05'.1	33'.5
14	27° 05'.0	33'.0
15	42° 04'.8	32'.4
16	57° 04'.6	31'.8
17	72° 04'.5	31'.2
18	87° 04'.3	30'.6
19	102° 04'.2	30'.0
20	117° 04'.0	29'.5
21	132° 03'.8	28'.9
22	147° 03'.7	28'.3
23	162° 03'.5	27'.7
23 00	177° 03'.3	19° 27'.1 S
01	192° 03'.2	26'.5
02	207° 03'.0	25'.9
03	222° 02'.9	25'.4
04	237° 02'.7	24'.8
05	252° 02'.6	24'.2
06	267° 02'.4	23'.6
07	282° 02'.2	23'.0
08	297° 02'.1	22'.4
09	312° 01'.9	21'.8
10	327° 01'.8	21'.2
11	342° 01'.6	20'.6
12	357° 01'.5	19° 20'.0 S
13	12° 01'.3	19'.4
14	27° 01'.2	18'.9
15	42° 01'.0	18'.3
16	57° 00'.8	17'.7
17	72° 00'.7	17'.1
18	87° 00'.5	16'.5
19	102° 00'.4	15'.9
20	117° 00'.2	15'.3
21	132° 00'.1	14'.7
22	146° 59'.9	14'.1
23	161° 59'.8	13'.5
24 00	176° 59'.6	19° 12'.9 S
01	191° 59'.5	12'.3
02	206° 59'.3	11'.7
03	221° 59'.2	11'.1
04	236° 59'.0	10'.5
05	251° 58'.9	09'.9
06	266° 58'.7	09'.3
07	281° 58'.6	08'.7
08	296° 58'.4	08'.0
09	311° 58'.3	07'.4
10	326° 58'.1	06'.8
11	341° 58'.0	06'.2
12	356° 57'.8	19° 05'.6 S
13	11° 57'.7	05'.0
14	26° 57'.5	04'.4
15	41° 57'.4	03'.8
16	56° 57'.3	03'.2
17	71° 57'.1	02'.6
18	86° 57'.0	02'.0
19	101° 56'.8	01'.3
20	116° 56'.7	00'.7
21	131° 56'.5	00'.1
22	146° 56'.4	18° 59'.5 S
23	161° 56'.2	58'.9
	SD 16'.2	d 0'.6

MOON	GHA	v	Dec	d	HP
22 00	58° 23'.9	12'.1	20° 08'.2 N	2'.7	54'.1
01	72° 55'.0	12'.1	10'.9	2'.6	
02	87° 26'.1	12'.2	13'.5	2'.6	
03	101° 57'.3	12'.0	16'.1	2'.4	
04	116° 28'.3	12'.1	18'.5	2'.4	
05	130° 59'.4	12'.1	20'.9	2'.2	
06	145° 30'.5	12'.0	23'.1	2'.2	
07	160° 01'.5	12'.0	25'.3	2'.1	
08	174° 32'.5	12'.0	27'.4	2'.0	
09	189° 03'.5	12'.0	29'.4	1'.8	
10	203° 34'.5	12'.0	31'.2	1'.8	
11	218° 05'.5	11'.9	33'.0	1'.7	
12	232° 36'.4	12'.0	20° 34'.7 N	1'.6	54'.1
13	247° 07'.4	11'.9	36'.3	1'.5	
14	261° 38'.3	11'.9	37'.8	1'.5	
15	276° 09'.2	11'.9	39'.3	1'.3	
16	290° 40'.1	11'.9	40'.6	1'.2	
17	305° 11'.0	11'.9	41'.8	1'.1	
18	319° 41'.9	11'.8	42'.9	1'.0	
19	334° 12'.7	11'.9	43'.9	1'.0	
20	348° 43'.6	11'.8	44'.9	0'.8	
21	3° 14'.4	11'.9	45'.7	0'.8	
22	17° 45'.3	11'.8	46'.5	0'.6	
23	32° 16'.1	11'.8	47'.1	0'.6	
23 00	46° 46'.9	11'.8	20° 47'.7 N	0'.4	54'.1
01	61° 17'.7	11'.8	48'.1	0'.4	
02	75° 48'.5	11'.7	48'.5	0'.2	
03	90° 19'.2	11'.8	48'.7	0'.2	
04	104° 50'.0	11'.8	48'.9	0'.1	
05	119° 20'.8	11'.7	49'.0	0'.1	
06	133° 51'.5	11'.8	48'.9	0'.1	
07	148° 22'.3	11'.7	48'.8	0'.2	
08	162° 53'.0	11'.7	48'.6	0'.3	54'.2
09	177° 23'.7	11'.8	48'.3	0'.4	
10	191° 54'.5	11'.7	47'.9	0'.6	
11	206° 25'.2	11'.7	47'.3	0'.6	
12	220° 55'.9	11'.7	20° 46'.7 N	0'.7	54'.2
13	235° 26'.6	11'.7	46'.0	0'.8	
14	249° 57'.3	11'.7	45'.2	0'.9	
15	264° 28'.0	11'.7	44'.3	1'.0	
16	278° 58'.7	11'.7	43'.3	1'.1	
17	293° 29'.4	11'.7	42'.2	1'.2	
18	308° 00'.1	11'.7	41'.0	1'.3	
19	322° 30'.8	11'.6	39'.7	1'.3	
20	337° 01'.4	11'.7	38'.4	1'.5	
21	351° 32'.1	11'.7	36'.9	1'.6	
22	6° 02'.8	11'.7	35'.3	1'.7	
23	20° 33'.5	11'.7	33'.6	1'.8	54'.3
24 00	35° 04'.2	11'.6	20° 31'.8 N	1'.8	54'.3
01	49° 34'.8	11'.7	30'.0	2'.0	
02	64° 05'.5	11'.7	28'.0	2'.1	
03	78° 36'.2	11'.7	25'.9	2'.1	
04	93° 06'.9	11'.7	23'.8	2'.3	
05	107° 37'.6	11'.7	21'.5	2'.4	
06	122° 08'.3	11'.7	19'.1	2'.4	
07	136° 39'.0	11'.7	16'.7	2'.6	
08	151° 09'.7	11'.6	14'.1	2'.6	
09	165° 40'.3	11'.8	11'.5	2'.7	
10	180° 11'.1	11'.7	08'.8	2'.9	54'.4
11	194° 41'.8	11'.7	05'.9	2'.9	
12	209° 12'.5	11'.7	20° 03'.0 N	3'.0	54'.4
13	223° 43'.2	11'.7	20° 00'.0 N	3'.2	
14	238° 13'.9	11'.7	56'.8	3'.2	
15	252° 44'.6	11'.8	53'.6	3'.3	
16	267° 15'.4	11'.7	50'.3	3'.4	
17	281° 46'.1	11'.8	46'.9	3'.5	
18	296° 16'.9	11'.7	43'.4	3'.6	
19	310° 47'.6	11'.8	39'.8	3'.7	
20	325° 18'.4	11'.8	36'.1	3'.8	54'.5
21	339° 49'.2	11'.8	32'.3	3'.8	
22	354° 20'.0	11'.7	28'.5	4'.0	
23	8° 50'.7	11'.8	24'.5	4'.1	
	SD 14'.7		14'.8	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 22	Moonrise 23	Moonrise 24
N 72°	07:39	09:17	-	-	-	-
N 70°	07:27	08:52	10:39	-	-	-
68°	07:17	08:32	09:56	09:57	10:36	11:46
66°	07:09	08:16	09:27	10:39	11:23	12:26
64°	07:02	08:04	09:05	11:08	11:53	12:53
62°	06:56	07:53	08:48	11:30	12:16	13:14
60°	06:51	07:43	08:33	11:48	12:34	13:31
N 58°	06:46	07:35	08:21	12:03	12:49	13:45
56°	06:41	07:27	08:10	12:16	13:02	13:58
54°	06:37	07:21	08:01	12:27	13:14	14:08
52°	06:33	07:15	07:52	12:36	13:24	14:18
50°	06:29	07:09	07:45	12:45	13:33	14:26
45°	06:21	06:57	07:29	13:04	13:51	14:44
N 40°	06:14	06:46	07:16	13:19	14:07	14:59
35°	06:07	06:37	07:04	13:32	14:20	15:11
30°	06:00	06:29	06:55	13:43	14:31	15:22
20°	05:47	06:14	06:37	14:02	14:51	15:41
N 10°	05:35	06:00	06:22	14:19	15:07	15:57
0°	05:21	05:46	06:08	14:35	15:23	16:12
S 10°	05:05	05:32	05:54	14:51	15:39	16:27
20°	04:47	05:15	05:39	15:08	15:56	16:43
30°	04:23	04:54	05:21	15:27	16:16	17:01
35°	04:08	04:42	05:10	15:38	16:27	17:12
40°	03:49	04:27	04:58	15:51	16:40	17:24
45°	03:25	04:09	04:44	16:07	16:55	17:39
S 50°	02:53	03:46	04:26	16:26	17:14	17:57
52°	02:36	03:35	04:18	16:35	17:23	18:05
54°	02:14	03:22	04:09	16:45	17:33	18:14
56°	01:46	03:07	03:58	16:56	17:45	18:25
58°	00:57	02:49	03:46	17:09	17:58	18:37
S 60°	-	02:26	03:32	17:25	18:13	18:51
S 62°	-	01:55	03:15	17:43	18:31	19:07

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 22	Moonset 23	Moonset 24
N 72°	-	15:08	16:47	-	-	-
N 70°	13:45	15:33	16:58	-	-	-
68°	14:29	15:53	17:07	06:45	07:46	08:16
66°	14:58	16:08	17:15	06:03	06:59	07:37
64°	15:20	16:21	17:22	05:34	06:29	07:09
62°	15:37	16:32	17:28	05:12	06:06	06:48
60°	15:51	16:41	17:34	04:55	05:48	06:31
N 58°	16:04	16:50	17:39	04:40	05:33	06:16
56°	16:14	16:57	17:43	04:27	05:20	06:04
54°	16:24	17:04	17:47	04:16	05:08	05:53
52°	16:32	17:10	17:51	04:07	04:58	05:43
50°	16:39	17:15	17:55	03:58	04:49	05:35
45°	16:55	17:27	18:03	03:40	04:30	05:17
N 40°	17:08	17:38	18:11	03:25	04:15	05:02
35°	17:20	17:47	18:17	03:12	04:02	04:49
30°	17:30	17:55	18:24	03:01	03:51	04:38
20°	17:46	18:10	18:37	02:42	03:31	04:19
N 10°	18:01	18:24	18:49	02:26	03:14	04:02
0°	18:15	18:37	19:03	02:10	02:58	03:47
S 10°	18:30	18:52	19:18	01:55	02:42	03:31
20°	18:45	19:09	19:37	01:38	02:25	03:14
30°	19:03	19:29	20:00	01:19	02:06	02:55
35°	19:13	19:41	20:16	01:08	01:54	02:44
40°	19:25	19:56	20:34	00:56	01:41	02:31
45°	19:39	20:14	20:57	00:41	01:26	02:16
S 50°	19:56	20:36	21:29	00:23	01:07	01:57
52°	20:05	20:47	21:46	00:14	00:58	01:48
54°	20:14	21:00	22:07	00:05	00:48	01:38
56°	20:24	21:15	22:35	-	00:36	01:27
58°	20:36	21:32	23:19	-	00:23	01:14
S 60°	20:50	21:55	-	-	00:08	00:59
S 62°	21:06	22:24	-	23:49	-	00:41

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
22	11 31	11 39	12:12	20:47	08:23	11d 81%
23	11 46	11 54	12:12	21:35	09:11	12d 88%
24	12 01	12 08	12:12	22:23	09:59	13d 93%

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2013 January 25, 26, 27 (Fri, Sat, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
25 Friday 00	124° 28'.0	192° 57'.5	22° 17'.0 S	158° 09'.8	14° 39'.5 S	59° 50'.4	20° 45'.9 N	265° 07'.3	12° 49'.2 S
01	139° 30'.5	207° 56'.6	16'.7	173° 10'.4	38'.9	74° 52'.9	45'.9	280° 09'.6	49'.2
02	154° 32'.9	222° 55'.7	16'.3	188° 10'.9	38'.2	89° 55'.4	45'.9	295° 12'.0	49'.2
03	169° 35'.4	237° 54'.8	16'.0	203° 11'.5	37'.5	104° 57'.9	45'.9	310° 14'.3	49'.2
04	184° 37'.9	252° 53'.9	15'.6	218° 12'.0	36'.9	120° 00'.4	45'.9	325° 16'.7	49'.3
05	199° 40'.3	267° 53'.0	15'.2	233° 12'.5	36'.2	135° 02'.9	45'.9	340° 19'.1	49'.3
06	214° 42'.8	282° 52'.1	14'.9	248° 13'.1	35'.5	150° 05'.4	45'.9	355° 21'.4	49'.3
07	229° 45'.2	297° 51'.2	14'.5	263° 13'.6	34'.9	165° 08'.0	45'.9	10° 23'.8	49'.3
08	244° 47'.7	312° 50'.3	14'.1	278° 14'.2	34'.2	180° 10'.5	45'.9	25° 26'.1	49'.3
09	259° 50'.2	327° 49'.4	13'.8	293° 14'.7	33'.5	195° 13'.0	45'.9	40° 28'.5	49'.4
10	274° 52'.6	342° 48'.5	13'.4	308° 15'.3	32'.9	210° 15'.5	45'.9	55° 30'.8	49'.4
11	289° 55'.1	357° 47'.6	13'.0	323° 15'.8	32'.2	225° 18'.0	45'.9	70° 33'.2	49'.4
12	304° 57'.6	12° 46'.7	22° 12'.7 S	338° 16'.3	14° 31'.5 S	240° 20'.5	20° 45'.9 N	85° 35'.6	12° 49'.4 S
13	320° 00'.0	27° 45'.8	12'.3	353° 16'.9	30'.9	255° 23'.0	45'.9	100° 37'.9	49'.5
14	335° 02'.5	42° 44'.9	11'.9	8° 17'.4	30'.2	270° 25'.5	45'.9	115° 40'.3	49'.5
15	350° 05'.0	57° 44'.0	11'.6	23° 18'.0	29'.5	285° 28'.0	45'.9	130° 42'.6	49'.5
16	5° 07'.4	72° 43'.1	11'.2	38° 18'.5	28'.9	300° 30'.5	45'.9	145° 45'.0	49'.5
17	20° 09'.9	87° 42'.2	10'.8	53° 19'.1	28'.2	315° 33'.1	45'.9	160° 47'.4	49'.6
18	35° 12'.3	102° 41'.3	10'.4	68° 19'.6	27'.5	330° 35'.6	45'.9	175° 49'.7	49'.6
19	50° 14'.8	117° 40'.4	10'.0	83° 20'.1	26'.9	345° 38'.1	45'.9	190° 52'.1	49'.6
20	65° 17'.3	132° 39'.5	09'.7	98° 20'.7	26'.2	0° 40'.6	45'.9	205° 54'.5	49'.6
21	80° 19'.7	147° 38'.6	09'.3	113° 21'.2	25'.5	15° 43'.1	45'.9	220° 56'.8	49'.6
22	95° 22'.2	162° 37'.7	08'.9	128° 21'.8	24'.8	30° 45'.6	45'.9	235° 59'.2	49'.7
23	110° 24'.7	177° 36'.8	08'.5	143° 22'.3	24'.2	45° 48'.1	45'.9	251° 01'.5	49'.7
26 Saturday 00	125° 27'.1	192° 35'.9	22° 08'.1 S	158° 22'.9	14° 23'.5 S	60° 50'.6	20° 45'.9 N	266° 03'.9	12° 49'.7 S
01	140° 29'.6	207° 35'.0	07'.8	173° 23'.4	22'.8	75° 53'.1	45'.9	281° 06'.3	49'.7
02	155° 32'.1	222° 34'.1	07'.4	188° 24'.0	22'.2	90° 55'.6	45'.9	296° 08'.6	49'.7
03	170° 34'.5	237° 33'.3	07'.0	203° 24'.5	21'.5	105° 58'.1	45'.9	311° 11'.0	49'.8
04	185° 37'.0	252° 32'.4	06'.6	218° 25'.1	20'.8	121° 00'.6	46'.0	326° 13'.3	49'.8
05	200° 39'.5	267° 31'.5	06'.2	233° 25'.6	20'.1	136° 03'.1	46'.0	341° 15'.7	49'.8
06	215° 41'.9	282° 30'.6	05'.8	248° 26'.1	19'.5	151° 05'.6	46'.0	356° 18'.1	49'.8
07	230° 44'.4	297° 29'.7	05'.4	263° 26'.7	18'.8	166° 08'.1	46'.0	11° 20'.4	49'.9
08	245° 46'.8	312° 28'.8	05'.0	278° 27'.2	18'.1	181° 10'.6	46'.0	26° 22'.8	49'.9
09	260° 49'.3	327° 27'.9	04'.6	293° 27'.8	17'.5	196° 13'.1	46'.0	41° 25'.2	49'.9
10	275° 51'.8	342° 27'.0	04'.2	308° 28'.3	16'.8	211° 15'.7	46'.0	56° 27'.5	49'.9
11	290° 54'.2	357° 26'.1	03'.8	323° 28'.9	16'.1	226° 18'.2	46'.0	71° 29'.9	49'.9
12	305° 56'.7	12° 25'.2	22° 03'.4 S	338° 29'.4	14° 15'.4 S	241° 20'.7	20° 46'.0 N	86° 32'.3	12° 50'.0 S
13	320° 59'.2	27° 24'.3	03'.0	353° 30'.0	14'.8	256° 23'.2	46'.0	101° 34'.6	50'.0
14	336° 01'.6	42° 23'.5	02'.6	8° 30'.5	14'.1	271° 25'.7	46'.0	116° 37'.0	50'.0
15	351° 04'.1	57° 22'.6	02'.2	23° 31'.1	13'.4	286° 28'.2	46'.0	131° 39'.3	50'.0
16	6° 06'.6	72° 21'.7	01'.8	38° 31'.6	12'.7	301° 30'.7	46'.0	146° 41'.7	50'.1
17	21° 09'.0	87° 20'.8	01'.4	53° 32'.2	12'.1	316° 33'.2	46'.0	161° 44'.1	50'.1
18	36° 11'.5	102° 19'.9	01'.0	68° 32'.7	11'.4	331° 35'.7	46'.0	176° 46'.4	50'.1
19	51° 14'.0	117° 19'.0	00'.6	83° 33'.3	10'.7	346° 38'.2	46'.0	191° 48'.8	50'.1
20	66° 16'.4	132° 18'.1	00'.2	98° 33'.8	10'.0	1° 40'.7	46'.0	206° 51'.2	50'.1
21	81° 18'.9	147° 17'.2	21° 59'.8 S	113° 34'.4	09'.4	16° 43'.2	46'.0	221° 53'.5	50'.2
22	96° 21'.3	162° 16'.3	59'.4	128° 34'.9	08'.7	31° 45'.7	46'.0	236° 55'.9	50'.2
23	111° 23'.8	177° 15'.5	59'.0	143° 35'.5	08'.0	46° 48'.2	46'.0	251° 58'.3	50'.2
27 Sunday 00	126° 26'.3	192° 14'.6	21° 58'.6 S	158° 36'.0	14° 07'.3 S	61° 50'.6	20° 46'.0 N	267° 00'.6	12° 50'.2 S
01	141° 28'.7	207° 13'.7	58'.2	173° 36'.6	06'.7	76° 53'.1	46'.0	282° 03'.0	50'.2
02	156° 31'.2	222° 12'.8	57'.7	188° 37'.1	06'.0	91° 55'.6	46'.0	297° 05'.4	50'.3
03	171° 33'.7	237° 11'.9	57'.3	203° 37'.7	05'.3	106° 58'.1	46'.0	312° 07'.7	50'.3
04	186° 36'.1	252° 11'.0	56'.9	218° 38'.2	04'.6	122° 00'.6	46'.0	327° 10'.1	50'.3
05	201° 38'.6	267° 10'.2	56'.5	233° 38'.8	03'.9	137° 03'.1	46'.1	342° 12'.5	50'.3
06	216° 41'.1	282° 09'.3	56'.1	248° 39'.3	03'.3	152° 05'.6	46'.1	357° 14'.8	50'.3
07	231° 43'.5	297° 08'.4	55'.7	263° 39'.9	02'.6	167° 08'.1	46'.1	12° 17'.2	50'.4
08	246° 46'.0	312° 07'.5	55'.2	278° 40'.4	01'.9	182° 10'.6	46'.1	27° 19'.6	50'.4
09	261° 48'.4	327° 06'.6	54'.8	293° 41'.0	01'.2	197° 13'.1	46'.1	42° 21'.9	50'.4
10	276° 50'.9	342° 05'.7	54'.4	308° 41'.5	00'.5	212° 15'.6	46'.1	57° 24'.3	50'.4
11	291° 53'.4	357° 04'.9	54'.0	323° 42'.1	13° 59'.9 S	227° 18'.1	46'.1	72° 26'.7	50'.4
12	306° 55'.8	12° 04'.0	21° 53'.5 S	338° 42'.6	13° 59'.2 S	242° 20'.6	20° 46'.1 N	87° 29'.0	12° 50'.5 S
13	321° 58'.3	27° 03'.1	53'.1	353° 43'.2	58'.5	257° 23'.1	46'.1	102° 31'.4	50'.5
14	337° 00'.8	42° 02'.2	52'.7	8° 43'.7	57'.8	272° 25'.6	46'.1	117° 33'.8	50'.5
15	352° 03'.2	57° 01'.3	52'.3	23° 44'.3	57'.1	287° 28'.1	46'.1	132° 36'.1	50'.5
16	7° 05'.7	72° 00'.4	51'.8	38° 44'.8	56'.5	302° 30'.6	46'.1	147° 38'.5	50'.5
17	22° 08'.2	86° 59'.6	51'.4	53° 45'.4	55'.8	317° 33'.0	46'.1	162° 40'.9	50'.6
18	37° 10'.6	101° 58'.7	51'.0	68° 45'.9	55'.1	332° 35'.5	46'.1	177° 43'.2	50'.6
19	52° 13'.1	116° 57'.8	50'.5	83° 46'.5	54'.4	347° 38'.0	46'.1	192° 45'.6	50'.6
20	67° 15'.6	131° 56'.9	50'.1	98° 47'.0	53'.7	2° 40'.5	46'.1	207° 48'.0	50'.6
21	82° 18'.0	146° 56'.1	49'.7	113° 47'.6	53'.1	17° 43'.0	46'.1	222° 50'.4	50'.6
22	97° 20'.5	161° 55'.2	49'.2	128° 48'.2	52'.4	32° 45'.5	46'.1	237° 52'.7	50'.7
23	112° 22'.9	176° 54'.3	48'.8	143° 48'.7	51'.7	47° 48'.0	46'.2	252° 55'.1	50'.7
	M.P. 15:36	v -0'.9	d 0'.4	v 0'.5	d 0'.7	v 2'.5	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.5	40° 15'.4 S
Achernar	335° 27'.1	57° 10'.5 S
Acrux	173° 09'.2	63° 10'.1 S
Adhara	255° 12'.3	28° 59'.7 S
Aldebaran	290° 49'.4	16° 32'.0 N
Alioth	166° 20'.7	55° 53'.0 N
Alkaid	152° 59'.0	49° 14'.5 N
Alnair	27° 44'.5	46° 53'.9 S
Alnilam	275° 46'.3	1° 11'.8 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.3	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.9 N
Altair	62° 08'.8	8° 54'.3 N
Ankaa	353° 16'.2	42° 14'.3 S
Antares	112° 26'.7	26° 27'.5 S
Arcturus	145° 55'.9	19° 06'.7 N
Atria	107° 29'.1	69° 02'.7 S
Avior	234° 17'.4	59° 33'.3 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.8	52° 42'.5 S
Capella	280° 34'.4	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.8 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.5	61° 40'.5 N
Elnath	278° 12'.6	28° 37'.0 N
Eltanin	90° 46'.7	51° 29'.2 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.5	29° 33'.2 S
Gacrux	172° 00'.8	57° 11'.1 S
Gienah	175° 52'.4	17° 36'.9 S
Hadar	148° 48'.1	60° 25'.9 S
Hamal	328° 01'.0	23° 31'.5 N
Kaus Aust.	83° 44'.5	34° 22'.5 S
Kochab	137° 20'.2	74° 05'.8 N
Markab	13° 38'.8	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.4 N
Menkent	148° 07'.8	36° 25'.9 S
Miaplacidus	221° 38'.7	69° 46'.4 S
Mirfak	308° 40'.5	49° 54'.6 N
Nunki	75° 59'.0	26° 16'.7 S
Peacock	53° 20'.2	56° 41'.4 S
Polaris	317° 49'.0	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.2 N
Rasalhague	96° 06'.9	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.0	8° 11'.4 S
Rigil Kent	139° 52'.0	60° 53'.0 S
Sabik	102° 13'.0	15° 44'.3 S
Schedar	349° 41'.0	56° 36'.8 N
Shaula	96° 22'.5	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.3 S
Spica	158° 31'.4	11° 13'.8 S
Suhail	222° 52'.1	43° 29'.3 S
Vega	80° 39'.5	38° 47'.7 N
Zuben'ubi	137° 05'.7	16° 05'.7 S

	SHA	Mer.Pass.
Venus	67° 08'.8	11:10
Mars	32° 55'.7	13:26
Jupiter	295° 23'.5	19:53
Saturn	140° 36'.8	06:15

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
176° 56'.1	18° 58'.3 S	23° 21'.5	11'.9	19° 20'.4 N	4'.1	54'.5
191° 56'.0	57'.7	37° 52'.4	11'.8	16'.3	4'.3	
206° 55'.8	57'.0	52° 23'.2	11'.8	12'.0	4'.3	
221° 55'.7	56'.4	66° 54'.0	11'.9	07'.7	4'.5	
236° 55'.5	55'.8	81° 24'.9	11'.8	03'.2	4'.5	54'.6
251° 55'.4	55'.2	95° 55'.7	11'.9	18° 58'.7 N	4'.6	
266° 55'.2	54'.6	110° 26'.6	11'.9	54'.1	4'.7	
281° 55'.1	54'.0	124° 57'.5	11'.9	49'.4	4'.8	
296° 55'.0	53'.3	139° 28'.4	11'.9	44'.6	4'.9	
311° 54'.8	52'.7	153° 59'.3	11'.9	39'.7	5'.0	
326° 54'.7	52'.1	168° 30'.2	11'.9	34'.7	5'.0	
341° 54'.5	51'.5	183° 01'.1	12'.0	29'.7	5'.2	54'.7
356° 54'.4	18° 50'.8 S	197° 32'.1	11'.9	18° 24'.5 N	5'.2	54'.7
11° 54'.3	50'.2	212° 03'.0	12'.0	19'.3	5'.4	
26° 54'.1	49'.6	226° 34'.0	12'.0	13'.9	5'.4	
41° 54'.0	49'.0	241° 05'.0	12'.0	08'.5	5'.5	
56° 53'.9	48'.3	255° 36'.0	12'.0	03'.0	5'.6	
71° 53'.7	47'.7	270° 07'.0	12'.0	17° 57'.4 N	5'.7	
86° 53'.6	47'.1	284° 38'.0	12'.1	51'.7	5'.8	54'.8
101° 53'.4	46'.5	299° 09'.1	12'.1	45'.9	5'.8	
116° 53'.3	45'.8	313° 40'.2	12'.0	40'.1	6'.0	
131° 53'.2	45'.2	328° 11'.2	12'.1	34'.1	6'.0	
146° 53'.0	44'.6	342° 42'.3	12'.1	28'.1	6'.1	
161° 52'.9	44'.0	357° 13'.4	12'.2	22'.0	6'.2	
176° 52'.8	18° 43'.3 S	11° 44'.6	12'.1	17° 15'.8 N	6'.3	54'.8
191° 52'.6	42'.7	26° 15'.7	12'.2	09'.5	6'.4	54'.9
206° 52'.5	42'.1	40° 46'.9	12'.2	03'.1	6'.4	
221° 52'.4	41'.4	55° 18'.1	12'.1	16° 56'.7 N	6'.6	
236° 52'.2	40'.8	69° 49'.2	12'.3	50'.1	6'.6	
251° 52'.1	40'.2	84° 20'.5	12'.2	43'.5	6'.7	
266° 52'.0	39'.5	98° 51'.7	12'.2	36'.8	6'.8	
281° 51'.8	38'.9	113° 22'.9	12'.3	30'.0	6'.8	
296° 51'.7	38'.3	127° 54'.2	12'.3	23'.2	7'.0	55'.0
311° 51'.6	37'.6	142° 25'.5	12'.3	16'.2	7'.0	
326° 51'.4	37'.0	156° 56'.8	12'.3	09'.2	7'.1	
341° 51'.3	36'.4	171° 28'.1	12'.3	02'.1	7'.2	
356° 51'.2	18° 35'.7 S	185° 59'.4	12'.4	15° 54'.9 N	7'.2	55'.0
11° 51'.1	35'.1	200° 30'.8	12'.3	47'.7	7'.4	
26° 50'.9	34'.5	215° 02'.1	12'.4	40'.3	7'.4	55'.1
41° 50'.8	33'.8	229° 33'.5	12'.4	32'.9	7'.5	
56° 50'.7	33'.2	244° 04'.9	12'.5	25'.4	7'.5	
71° 50'.5	32'.5	258° 36'.4	12'.4	17'.9	7'.7	
86° 50'.4	31'.9	273° 07'.8	12'.5	10'.2	7'.7	
101° 50'.3	31'.3	287° 39'.3	12'.4	02'.5	7'.8	
116° 50'.2	30'.6	302° 10'.7	12'.5	14° 54'.7 N	7'.8	55'.2
131° 50'.0	30'.0	316° 42'.2	12'.5	46'.9	8'.0	
146° 49'.9	29'.3	331° 13'.7	12'.6	38'.9	8'.0	
161° 49'.8	28'.7	345° 45'.3	12'.5	30'.9	8'.1	
176° 49'.6	18° 28'.0 S	0° 16'.8	12'.6	14° 22'.8 N	8'.1	55'.2
191° 49'.5	27'.4	14° 48'.4	12'.6	14'.7	8'.3	55'.3
206° 49'.4	26'.8	29° 20'.0	12'.6	06'.4	8'.2	
221° 49'.3	26'.1	43° 51'.6	12'.6	13° 58'.2 N	8'.4	
236° 49'.1	25'.5	58° 23'.2	12'.6	49'.8	8'.5	
251° 49'.0	24'.8	72° 54'.8	12'.7	41'.3	8'.5	
266° 48'.9	24'.2	87° 26'.5	12'.6	32'.8	8'.5	
281° 48'.8	23'.5	101° 58'.1	12'.7	24'.3	8'.7	55'.4
296° 48'.7	22'.9	116° 29'.8	12'.7	15'.6	8'.7	
311° 48'.5	22'.2	131° 01'.5	12'.7	06'.9	8'.7	
326° 48'.4	21'.6	145° 33'.2	12'.8	12° 58'.2 N	8'.9	
341° 48'.3	20'.9	160° 05'.0	12'.7	49'.3	8'.9	
356° 48'.2	18° 20'.3 S	174° 36'.7	12'.8	12° 40'.4 N	8'.9	55'.4
11° 48'.0	19'.6	189° 08'.5	12'.8	31'.5	9'.1	55'.5
26° 47'.9	19'.0	203° 40'.3	12'.8	22'.4	9'.1	
41° 47'.8	18'.3	218° 12'.1	12'.8	13'.3	9'.1	
56° 47'.7	17'.7	232° 43'.9	12'.8	04'.2	9'.2	
71° 47'.6	17'.0	247° 15'.7	12'.9	11° 55'.0 N	9'.3	
86° 47'.4	16'.4	261° 47'.6	12'.8	45'.7	9'.4	55'.6
101° 47'.3	15'.7	276° 19'.4	12'.9	36'.3	9'.3	
116° 47'.2	15'.0	290° 51'.3	12'.9	27'.0	9'.5	
131° 47'.1	14'.4	305° 23'.2	12'.9	17'.5	9'.5	
146° 47'.0	13'.7	319° 55'.1	12'.9	08'.0	9'.6	
161° 46'.8	13'.1	334° 27'.0	12'.9	10° 58'.4 N	9'.6	55'.7
SD 16'.2	d 0'.6	SD 14'.9		15'.0	15'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 25	Moonrise 26	Moonrise 27
N 72°	07:29	09:04	11:34	-	13:42	15:45
N 70°	07:19	08:41	10:19	12:31	14:22	16:07
68°	07:10	08:23	09:42	13:14	14:48	16:24
66°	07:03	08:09	09:17	13:43	15:09	16:38
64°	06:57	07:57	08:57	14:05	15:25	16:49
62°	06:51	07:47	08:40	14:23	15:39	16:58
60°	06:46	07:38	08:27	14:37	15:50	17:06
N 58°	06:42	07:30	08:15	14:50	16:00	17:14
56°	06:37	07:23	08:05	15:00	16:08	17:20
54°	06:33	07:17	07:56	15:10	16:16	17:25
52°	06:30	07:11	07:49	15:18	16:23	17:30
50°	06:27	07:06	07:41	15:25	16:29	17:35
45°	06:19	06:54	07:26	15:41	16:42	17:45
N 40°	06:12	06:45	07:14	15:54	16:53	17:53
35°	06:05	06:36	07:03	16:06	17:02	18:00
30°	05:59	06:28	06:53	16:15	17:10	18:06
20°	05:47	06:14	06:37	16:32	17:24	18:16
N 10°	05:35	06:00	06:23	16:46	17:36	18:26
0°	05:22	05:47	06:09	17:00	17:48	18:34
S 10°	05:07	05:33	05:55	17:13	17:59	18:43
20°	04:49	05:17	05:41	17:28	18:11	18:52
30°	04:26	04:57	05:23	17:44	18:25	19:03
35°	04:11	04:45	05:13	17:54	18:33	19:09
40°	03:53	04:31	05:02	18:05	18:42	19:15
45°	03:31	04:14	04:48	18:18	18:52	19:23
S 50°	03:00	03:52	04:31	18:33	19:05	19:33
52°	02:44	03:42	04:24	18:41	19:11	19:37
54°	02:24	03:29	04:15	18:49	19:17	19:42
56°	01:59	03:15	04:05	18:58	19:25	19:47
58°	01:21	02:58	03:53	19:08	19:33	19:53
S 60°	-	02:37	03:40	19:20	19:42	20:00
S 62°	-	02:10	03:25	19:33	19:52	20:07

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 25	Moonset 26	Moonset 27
N 72°	12:52	15:22	16:57	-	09:42	09:17
N 70°	14:07	15:45	17:08	09:13	09:02	08:54
68°	14:44	16:03	17:16	08:29	08:34	08:35
66°	15:10	16:17	17:23	07:59	08:12	08:21
64°	15:29	16:29	17:29	07:37	07:55	08:09
62°	15:46	16:39	17:35	07:19	07:41	07:58
60°	15:59	16:48	17:40	07:04	07:29	07:49
N 58°	16:10	16:56	17:44	06:51	07:19	07:42
56°	16:20	17:03	17:49	06:40	07:10	07:35
54°	16:29	17:09	17:52	06:31	07:02	07:28
52°	16:37	17:15	17:56	06:22	06:55	07:23
50°	16:44	17:20	17:59	06:14	06:48	07:18
45°	16:59	17:31	18:07	05:58	06:34	07:07
N 40°	17:12	17:41	18:14	05:44	06:23	06:58
35°	17:23	17:50	18:20	05:32	06:13	06:50
30°	17:32	17:57	18:26	05:22	06:04	06:43
20°	17:48	18:12	18:38	05:05	05:49	06:31
N 10°	18:03	18:25	18:50	04:49	05:35	06:20
0°	18:16	18:38	19:03	04:35	05:23	06:10
S 10°	18:30	18:52	19:18	04:21	05:10	06:00
20°	18:44	19:08	19:36	04:05	04:57	05:49
30°	19:01	19:27	19:59	03:47	04:42	05:37
35°	19:11	19:39	20:13	03:37	04:32	05:30
40°	19:23	19:53	20:31	03:25	04:22	05:21
45°	19:36	20:10	20:53	03:11	04:10	05:12
S 50°	19:53	20:32	21:23	02:54	03:55	05:00
52°	20:01	20:42	21:39	02:46	03:48	04:55
54°	20:09	20:54	21:58	02:37	03:41	04:49
56°	20:19	21:08	22:23	02:26	03:32	04:42
58°	20:30	21:25	22:59	02:15	03:22	04:34
S 60°	20:43	21:45	-	02:01	03:11	04:26
S 62°	20:58	22:12	-	01:45	02:58	04:16

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON ◯ Age/ Vis
25	12 15	12 22	12:12	23:11	10:48	14d 97%
26	12 29	12 35	12:13	23:59	11:35	15d 99%
27	12 41	12 47	12:13	24:45	12:22	16d Full

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2013 January 28, 29, 30 (Mon, Tue, Wed)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.5		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
28 Monday 00	127° 25'.4	191° 53'.4	21° 48'.3 S	158° 49'.3	13° 51'.0 S	62° 50'.5	20° 46'.2 N	267° 57'.5	12° 50'.7 S
01	142° 27'.9	206° 52'.5	47'.9	173° 49'.8	50'.3	77° 53'.0	46'.2	282° 59'.8	50'.7
02	157° 30'.3	221° 51'.7	47'.5	188° 50'.4	49'.6	92° 55'.4	46'.2	298° 02'.2	50'.7
03	172° 32'.8	236° 50'.8	47'.0	203° 50'.9	49'.0	107° 57'.9	46'.2	313° 04'.6	50'.8
04	187° 35'.3	251° 49'.9	46'.6	218° 51'.5	48'.3	123° 00'.4	46'.2	328° 06'.9	50'.8
05	202° 37'.7	266° 49'.0	46'.1	233° 52'.0	47'.6	138° 02'.9	46'.2	343° 09'.3	50'.8
06	217° 40'.2	281° 48'.2	45'.7	248° 52'.6	46'.9	153° 05'.4	46'.2	358° 11'.7	50'.8
07	232° 42'.7	296° 47'.3	45'.2	263° 53'.1	46'.2	168° 07'.9	46'.2	13° 14'.1	50'.8
08	247° 45'.1	311° 46'.4	44'.8	278° 53'.7	45'.5	183° 10'.4	46'.2	28° 16'.4	50'.9
09	262° 47'.6	326° 45'.5	44'.3	293° 54'.3	44'.9	198° 12'.8	46'.2	43° 18'.8	50'.9
10	277° 50'.1	341° 44'.7	43'.9	308° 54'.8	44'.2	213° 15'.3	46'.2	58° 21'.2	50'.9
11	292° 52'.5	356° 43'.8	43'.4	323° 55'.4	43'.5	228° 17'.8	46'.2	73° 23'.5	50'.9
12	307° 55'.0	11° 42'.9	21° 43'.0 S	338° 55'.9	13° 42'.8 S	243° 20'.3	20° 46'.2 N	88° 25'.9	12° 50'.9 S
13	322° 57'.4	26° 42'.0	42'.5	353° 56'.5	42'.1	258° 22'.8	46'.2	103° 28'.3	50'.9
14	337° 59'.9	41° 41'.2	42'.1	8° 57'.0	41'.4	273° 25'.3	46'.2	118° 30'.7	51'.0
15	353° 02'.4	56° 40'.3	41'.6	23° 57'.6	40'.7	288° 27'.8	46'.3	133° 33'.0	51'.0
16	8° 04'.8	71° 39'.4	41'.1	38° 58'.2	40'.1	303° 30'.2	46'.3	148° 35'.4	51'.0
17	23° 07'.3	86° 38'.5	40'.7	53° 58'.7	39'.4	318° 32'.7	46'.3	163° 37'.8	51'.0
18	38° 09'.8	101° 37'.7	40'.2	68° 59'.3	38'.7	333° 35'.2	46'.3	178° 40'.2	51'.0
19	53° 12'.2	116° 36'.8	39'.8	83° 59'.8	38'.0	348° 37'.7	46'.3	193° 42'.5	51'.1
20	68° 14'.7	131° 35'.9	39'.3	99° 00'.4	37'.3	3° 40'.2	46'.3	208° 44'.9	51'.1
21	83° 17'.2	146° 35'.1	38'.8	114° 00'.9	36'.6	18° 42'.6	46'.3	223° 47'.3	51'.1
22	98° 19'.6	161° 34'.2	38'.4	129° 01'.5	35'.9	33° 45'.1	46'.3	238° 49'.6	51'.1
23	113° 22'.1	176° 33'.3	37'.9	144° 02'.1	35'.3	48° 47'.6	46'.3	253° 52'.0	51'.1
29 Tuesday 00	128° 24'.5	191° 32'.5	21° 37'.4 S	159° 02'.6	13° 34'.6 S	63° 50'.1	20° 46'.3 N	268° 54'.4	12° 51'.1 S
01	143° 27'.0	206° 31'.6	37'.0	174° 03'.2	33'.9	78° 52'.6	46'.3	283° 56'.8	51'.2
02	158° 29'.5	221° 30'.7	36'.5	189° 03'.7	33'.2	93° 55'.0	46'.3	298° 59'.1	51'.2
03	173° 31'.9	236° 29'.9	36'.0	204° 04'.3	32'.5	108° 57'.5	46'.3	314° 01'.5	51'.2
04	188° 34'.4	251° 29'.0	35'.6	219° 04'.9	31'.8	124° 00'.0	46'.3	329° 03'.9	51'.2
05	203° 36'.9	266° 28'.1	35'.1	234° 05'.4	31'.1	139° 02'.5	46'.4	344° 06'.3	51'.2
06	218° 39'.3	281° 27'.3	34'.6	249° 06'.0	30'.4	154° 04'.9	46'.4	359° 08'.6	51'.3
07	233° 41'.8	296° 26'.4	34'.1	264° 06'.5	29'.7	169° 07'.4	46'.4	14° 11'.0	51'.3
08	248° 44'.3	311° 25'.5	33'.7	279° 07'.1	29'.1	184° 09'.9	46'.4	29° 13'.4	51'.3
09	263° 46'.7	326° 24'.7	33'.2	294° 07'.7	28'.4	199° 12'.4	46'.4	44° 15'.8	51'.3
10	278° 49'.2	341° 23'.8	32'.7	309° 08'.2	27'.7	214° 14'.9	46'.4	59° 18'.1	51'.3
11	293° 51'.7	356° 22'.9	32'.2	324° 08'.8	27'.0	229° 17'.3	46'.4	74° 20'.5	51'.3
12	308° 54'.1	11° 22'.1	21° 31'.8 S	339° 09'.3	13° 26'.3 S	244° 19'.8	20° 46'.4 N	89° 22'.9	12° 51'.4 S
13	323° 56'.6	26° 21'.2	31'.3	354° 09'.9	25'.6	259° 22'.3	46'.4	104° 25'.3	51'.4
14	338° 59'.0	41° 20'.3	30'.8	9° 10'.5	24'.9	274° 24'.8	46'.4	119° 27'.6	51'.4
15	354° 01'.5	56° 19'.5	30'.3	24° 11'.0	24'.2	289° 27'.2	46'.4	134° 30'.0	51'.4
16	9° 04'.0	71° 18'.6	29'.8	39° 11'.6	23'.5	304° 29'.7	46'.4	149° 32'.4	51'.4
17	24° 06'.4	86° 17'.7	29'.3	54° 12'.1	22'.8	319° 32'.2	46'.5	164° 34'.8	51'.4
18	39° 08'.9	101° 16'.9	28'.8	69° 12'.7	22'.1	334° 34'.6	46'.5	179° 37'.2	51'.5
19	54° 11'.4	116° 16'.0	28'.4	84° 13'.3	21'.4	349° 37'.1	46'.5	194° 39'.5	51'.5
20	69° 13'.8	131° 15'.2	27'.9	99° 13'.8	20'.8	4° 39'.6	46'.5	209° 41'.9	51'.5
21	84° 16'.3	146° 14'.3	27'.4	114° 14'.4	20'.1	19° 42'.1	46'.5	224° 44'.3	51'.5
22	99° 18'.8	161° 13'.4	26'.9	129° 15'.0	19'.4	34° 44'.5	46'.5	239° 46'.7	51'.5
23	114° 21'.2	176° 12'.6	26'.4	144° 15'.5	18'.7	49° 47'.0	46'.5	254° 49'.0	51'.5
30 Wednesday 00	129° 23'.7	191° 11'.7	21° 25'.9 S	159° 16'.1	13° 18'.0 S	64° 49'.5	20° 46'.5 N	269° 51'.4	12° 51'.6 S
01	144° 26'.2	206° 10'.9	25'.4	174° 16'.6	17'.3	79° 51'.9	46'.5	284° 53'.8	51'.6
02	159° 28'.6	221° 10'.0	24'.9	189° 17'.2	16'.6	94° 54'.4	46'.5	299° 56'.2	51'.6
03	174° 31'.1	236° 09'.1	24'.4	204° 17'.8	15'.9	109° 56'.9	46'.5	314° 58'.6	51'.6
04	189° 33'.5	251° 08'.3	23'.9	219° 18'.3	15'.2	124° 59'.3	46'.6	330° 00'.9	51'.6
05	204° 36'.0	266° 07'.4	23'.4	234° 18'.9	14'.5	140° 01'.8	46'.6	345° 03'.3	51'.6
06	219° 38'.5	281° 06'.6	22'.9	249° 19'.5	13'.8	155° 04'.3	46'.6	0° 05'.7	51'.7
07	234° 40'.9	296° 05'.7	22'.4	264° 20'.0	13'.1	170° 06'.8	46'.6	15° 08'.1	51'.7
08	249° 43'.4	311° 04'.8	21'.9	279° 20'.6	12'.4	185° 09'.2	46'.6	30° 10'.4	51'.7
09	264° 45'.9	326° 04'.0	21'.4	294° 21'.2	11'.7	200° 11'.7	46'.6	45° 12'.8	51'.7
10	279° 48'.3	341° 03'.1	20'.9	309° 21'.7	11'.0	215° 14'.2	46'.6	60° 15'.2	51'.7
11	294° 50'.8	356° 02'.3	20'.4	324° 22'.3	10'.3	230° 16'.6	46'.6	75° 17'.6	51'.7
12	309° 53'.3	11° 01'.4	21° 19'.9 S	339° 22'.9	13° 09'.6 S	245° 19'.1	20° 46'.6 N	90° 20'.0	12° 51'.8 S
13	324° 55'.7	26° 00'.6	19'.4	354° 23'.4	08'.9	260° 21'.6	46'.6	105° 22'.3	51'.8
14	339° 58'.2	40° 59'.7	18'.9	9° 24'.0	08'.3	275° 24'.0	46'.6	120° 24'.7	51'.8
15	355° 00'.6	55° 58'.9	18'.4	24° 24'.5	07'.6	290° 26'.5	46'.7	135° 27'.1	51'.8
16	10° 03'.1	70° 58'.0	17'.8	39° 25'.1	06'.9	305° 28'.9	46'.7	150° 29'.5	51'.8
17	25° 05'.6	85° 57'.2	17'.3	54° 25'.7	06'.2	320° 31'.4	46'.7	165° 31'.9	51'.8
18	40° 08'.0	100° 56'.3	16'.8	69° 26'.2	05'.5	335° 33'.9	46'.7	180° 34'.2	51'.9
19	55° 10'.5	115° 55'.4	16'.3	84° 26'.8	04'.8	350° 36'.3	46'.7	195° 36'.6	51'.9
20	70° 13'.0	130° 54'.6	15'.8	99° 27'.4	04'.1	5° 38'.8	46'.7	210° 39'.0	51'.9
21	85° 15'.4	145° 53'.7	15'.3	114° 27'.9	03'.4	20° 41'.3	46'.7	225° 41'.4	51'.9
22	100° 17'.9	160° 52'.9	14'.7	129° 28'.5	02'.7	35° 43'.7	46'.7	240° 43'.8	51'.9
23	115° 20'.4	175° 52'.0	14'.2	144° 29'.1	02'.0	50° 46'.2	46'.7	255° 46'.2	51'.9
	M.P. 15:24	v -0'.9	d 0'.5	v 0'.6	d 0'.7	v 2'.5	d 0'.0	v 2'.4	d 0'.0

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 18'.5	40° 15'.4 S	176° 46'.7	18° 12'.4 S	348° 58'.9	13'.0	10° 48'.8 N	9'.7	55'.7
Achernar	335° 27'.1	57° 10'.5 S	191° 46'.6	11'.8	3° 30'.9	12'.9	39'.1	9'.7	
Acrux	173° 09'.2	63° 10'.2 S	206° 46'.5	11'.1	18° 02'.8	13'.0	29'.4	9'.8	
Adhara	255° 12'.4	28° 59'.7 S	221° 46'.4	10'.4	32° 34'.8	12'.9	19'.6	9'.9	
Aldebaran	290° 49'.5	16° 32'.0 N	236° 46'.3	09'.8	47° 06'.7	13'.0	09'.7	9'.9	
			251° 46'.1	09'.1	61° 38'.7	13'.0	9° 59'.8 N	9'.9	55'.8
Alioth	166° 20'.7	55° 53'.0 N	266° 46'.0	08'.5	76° 10'.7	13'.0	49'.9	10'.0	
Alkaid	152° 59'.0	49° 14'.5 N	281° 45'.9	07'.8	90° 42'.7	13'.1	39'.9	10'.1	
Alnair	27° 44'.5	46° 53'.9 S	296° 45'.8	07'.1	105° 14'.8	13'.0	29'.8	10'.1	
Alnilam	275° 46'.4	1° 11'.8 S	311° 45'.7	06'.5	119° 46'.8	13'.0	19'.7	10'.1	
Alphard	217° 56'.0	8° 43'.2 S	326° 45'.6	05'.8	134° 18'.8	13'.1	09'.6	10'.2	55'.9
			341° 45'.5	05'.1	148° 50'.9	13'.0	8° 59'.4 N	10'.3	
Alphecca	126° 11'.3	26° 40'.1 N	356° 45'.3	18° 04'.5 S	163° 22'.9	13'.1	8° 49'.1 N	10'.3	55'.9
Alpheratz	357° 43'.9	29° 09'.9 N	11° 45'.2	03'.8	177° 55'.0	13'.1	38'.8	10'.3	
Altair	62° 08'.8	8° 54'.3 N	26° 45'.1	03'.2	192° 27'.1	13'.0	28'.5	10'.4	
Ankaa	353° 16'.2	42° 14'.3 S	41° 45'.0	02'.5	206° 59'.1	13'.1	18'.1	10'.4	56'.0
Antares	112° 26'.7	26° 27'.5 S	56° 44'.9	01'.8	221° 31'.2	13'.1	07'.7	10'.5	
			71° 44'.8	01'.2	236° 03'.3	13'.1	7° 57'.2 N	10'.5	
Arcturus	145° 55'.9	19° 06'.7 N	86° 44'.7	00'.5	250° 35'.4	13'.1	46'.7	10'.6	
Atria	107° 29'.1	69° 02'.7 S	101° 44'.6	17° 59'.8 S	265° 07'.5	13'.1	36'.1	10'.6	
Avior	234° 17'.4	59° 33'.3 S	116° 44'.4	59'.1	279° 39'.6	13'.1	25'.5	10'.6	56'.1
Bellatrix	278° 32'.0	6° 21'.5 N	131° 44'.3	58'.5	294° 11'.7	13'.2	14'.9	10'.7	
Betelgeuse	271° 01'.3	7° 24'.4 N	146° 44'.2	57'.8	308° 43'.9	13'.1	04'.2	10'.7	
			161° 44'.1	57'.1	323° 16'.0	13'.1	6° 53'.5 N	10'.8	
Canopus	263° 55'.8	52° 42'.5 S	176° 44'.0	17° 56'.5 S	337° 48'.1	13'.1	6° 42'.7 N	10'.8	56'.1
Capella	280° 34'.5	46° 00'.6 N	191° 43'.9	55'.8	352° 20'.2	13'.2	31'.9	10'.8	56'.2
Deneb	49° 32'.1	45° 19'.7 N	206° 43'.8	55'.1	6° 52'.4	13'.1	21'.1	10'.9	
Denebola	182° 33'.7	14° 29'.7 N	221° 43'.7	54'.5	21° 24'.5	13'.1	10'.2	10'.9	
Diphda	348° 56'.3	17° 55'.0 S	236° 43'.6	53'.8	35° 56'.6	13'.2	5° 59'.3 N	10'.9	
			251° 43'.5	53'.1	50° 28'.8	13'.1	48'.4	11'.0	
Dubhe	193° 51'.5	61° 40'.5 N	266° 43'.4	52'.4	65° 00'.9	13'.1	37'.4	11'.0	56'.3
Elnath	278° 12'.6	28° 37'.0 N	281° 43'.3	51'.8	79° 33'.0	13'.2	26'.4	11'.0	
Eltanin	90° 46'.7	51° 29'.1 N	296° 43'.1	51'.1	94° 05'.2	13'.1	15'.4	11'.1	
Enif	33° 47'.7	9° 56'.2 N	311° 43'.0	50'.4	108° 37'.3	13'.1	04'.3	11'.1	
Fomalhaut	15° 24'.5	29° 33'.2 S	326° 42'.9	49'.7	123° 09'.4	13'.2	4° 53'.2 N	11'.1	
			341° 42'.8	49'.1	137° 41'.6	13'.1	42'.1	11'.2	56'.4
Gacrux	172° 00'.8	57° 11'.1 S	356° 42'.7	17° 48'.4 S	152° 13'.7	13'.1	4° 30'.9 N	11'.2	56'.4
Gienah	175° 52'.3	17° 37'.0 S	11° 42'.6	47'.7	166° 45'.8	13'.1	19'.7	11'.2	
Hadar	148° 48'.1	60° 25'.9 S	26° 42'.5	47'.0	181° 17'.9	13'.1	08'.5	11'.2	
Hamal	328° 01'.0	23° 31'.5 N	41° 42'.4	46'.3	195° 50'.0	13'.1	3° 57'.3 N	11'.3	
Kaus Aust.	83° 44'.5	34° 22'.5 S	56° 42'.3	45'.7	210° 22'.1	13'.1	46'.0	11'.3	56'.5
			71° 42'.2	45'.0	224° 54'.2	13'.1	34'.7	11'.3	
Kochab	137° 20'.2	74° 05'.8 N	86° 42'.1	44'.3	239° 26'.3	13'.1	23'.4	11'.3	
Markab	13° 38'.8	15° 16'.6 N	101° 42'.0	43'.6	253° 58'.4	13'.1	12'.1	11'.4	
Menkar	314° 15'.2	4° 08'.4 N	116° 41'.9	42'.9	268° 30'.5	13'.0	00'.7	11'.4	
Menkent	148° 07'.8	36° 25'.9 S	131° 41'.8	42'.2	283° 02'.5	13'.1	2° 49'.3 N	11'.4	56'.6
Miaplacidus	221° 38'.7	69° 46'.4 S	146° 41'.7	41'.6	297° 34'.6	13'.0	37'.9	11'.4	
			161° 41'.6	40'.9	312° 06'.6	13'.0	26'.5	11'.4	
Mirfak	308° 40'.5	49° 54'.6 N	176° 41'.5	17° 40'.2 S	326° 38'.6	13'.1	2° 15'.1 N	11'.5	56'.6
Nunki	75° 58'.9	26° 16'.7 S	191° 41'.4	39'.5	341° 10'.7	13'.0	03'.6	11'.4	
Peacock	53° 20'.2	56° 41'.4 S	206° 41'.3	38'.8	355° 42'.7	13'.0	1° 52'.2 N	11'.5	56'.7
Polaris	317° 50'.5	89° 19'.5 N	221° 41'.2	38'.1	10° 14'.7	13'.0	40'.7	11'.5	
Pollux	243° 27'.6	27° 59'.4 N	236° 41'.1	37'.5	24° 46'.7	12'.9	29'.2	11'.5	
			251° 41'.0	36'.8	39° 18'.6	13'.0	17'.7	11'.6	
Procyon	244° 59'.6	5° 11'.2 N	266° 40'.9	36'.1	53° 50'.6	12'.9	06'.1	11'.5	
Rasalhague	96° 06'.9	12° 33'.0 N	281° 40'.8	35'.4	68° 22'.5	12'.9	0° 54'.6 N	11'.6	56'.8
Regulus	207° 43'.5	11° 53'.9 N	296° 40'.7	34'.7	82° 54'.4	12'.9	43'.0	11'.5	
Rigel	281° 12'.1	8° 11'.4 S	311° 40'.6	34'.0	97° 26'.3	12'.9	31'.5	11'.6	
Rigil Kent	139° 52'.0	60° 53'.0 S	326° 40'.5	33'.3	111° 58'.2	12'.9	19'.9	11'.6	
			341° 40'.4	32'.6	126° 30'.1	12'.8	08'.3	11'.6	
Sabik	102° 13'.0	15° 44'.3 S	356° 40'.3	17° 31'.9 S	141° 01'.9	12'.9	0° 03'.3 S	11'.5	56'.9
Schedar	349° 41'.0	56° 36'.8 N	11° 40'.2	31'.3	155° 33'.8	12'.8	14'.8	11'.6	
Shaula	96° 22'.5	37° 06'.6 S	26° 40'.1	30'.6	170° 05'.6	12'.8	26'.4	11'.7	
Sirius	258° 33'.6	16° 44'.3 S	41° 40'.0	29'.9	184° 37'.4	12'.7	38'.1	11'.6	
Spica	158° 31'.4	11° 13'.8 S	56° 39'.9	29'.2	199° 09'.1	12'.8	49'.7	11'.6	
			71° 39'.8	28'.5	213° 40'.9	12'.7	1° 01'.3 S	11'.6	57'.0
Suhail	222° 52'.1	43° 29'.3 S	86° 39'.7	27'.8	228° 12'.6	12'.7	12'.9	11'.6	
Vega	80° 39'.5	38° 47'.7 N	101° 39'.6	27'.1	242° 44'.3	12'.7	24'.5	11'.6	
Zuben'ubi	137° 05'.7	16° 05'.7 S	116° 39'.5	26'.4	257° 16'.0	12'.6	36'.1	11'.6	
			131° 39'.5	25'.7	271° 47'.6	12'.6	47'.7	11'.6	
	SHA	Mer.Pass.	146° 39'.4	25'.0	286° 19'.2	12'.6	59'.3	11'.7	57'.1
Venus	63° 07'.9	11:14	161° 39'.3	24'.3	300° 50'.8	12'.6	2° 11'.0 S	11'.6	
Mars	30° 38'.1	13:23							
Jupiter	295° 25'.5	19:41							
Saturn	140° 29'.8	06:03	SD 16'.2	d 0'.7	SD	15'.2	15'.4	15'.5	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30
N 72°	07:19	08:51	10:53	17:38	19:28	21:18
N 70°	07:10	08:30	10:01	17:50	19:32	21:15
68°	07:03	08:14	09:29	18:00	19:36	21:13
66°	06:56	08:01	09:06	18:08	19:39	21:11
64°	06:51	07:50	08:48	18:14	19:41	21:09
62°	06:46	07:40	08:33	18:20	19:43	21:08
60°	06:41	07:32	08:20	18:25	19:45	21:07
N 58°	06:37	07:25	08:10	18:30	19:47	21:06
56°	06:33	07:18	08:00	18:33	19:48	21:05
54°	06:30	07:13	07:52	18:37	19:50	21:04
52°	06:26	07:07	07:44	18:40	19:51	21:03
50°	06:23	07:02	07:38	18:43	19:52	21:02
45°	06:16	06:52	07:23	18:49	19:54	21:01
N 40°	06:10	06:42	07:11	18:54	19:56	20:59
35°	06:04	06:34	07:01	18:59	19:58	20:58
30°	05:58	06:27	06:52	19:02	20:00	20:57
20°	05:47	06:13	06:36	19:09	20:02	20:56
N 10°	05:35	06:01	06:23	19:15	20:04	20:54
0°	05:23	05:48	06:10	19:21	20:07	20:53
S 10°	05:08	05:34	05:57	19:26	20:09	20:52
20°	04:51	05:19	05:42	19:32	20:11	20:50
30°	04:29	05:00	05:26	19:39	20:14	20:49
35°	04:15	04:49	05:16	19:42	20:15	20:48
40°	03:58	04:35	05:05	19:47	20:17	20:47
45°	03:36	04:19	04:53	19:52	20:19	20:46
S 50°	03:07	03:58	04:37	19:58	20:21	20:45
52°	02:52	03:48	04:29	20:01	20:23	20:44
54°	02:34	03:36	04:21	20:04	20:24	20:44
56°	02:11	03:23	04:11	20:07	20:25	20:43
58°	01:39	03:07	04:01	20:11	20:26	20:42
S 60°	00:29	02:48	03:48	20:15	20:28	20:41
S 62°	-	02:24	03:34	20:19	20:30	20:40

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 28	Moonset 29	Moonset 30
N 72°	13:34	15:37	17:08	09:01	08:47	08:35
N 70°	14:26	15:57	17:17	08:47	08:41	08:35
68°	14:58	16:13	17:25	08:36	08:35	08:34
66°	15:21	16:26	17:31	08:26	08:30	08:34
64°	15:39	16:37	17:37	08:18	08:26	08:33
62°	15:54	16:47	17:42	08:11	08:23	08:33
60°	16:07	16:55	17:46	08:06	08:20	08:33
N 58°	16:17	17:02	17:50	08:00	08:17	08:32
56°	16:27	17:09	17:54	07:56	08:14	08:32
54°	16:35	17:14	17:57	07:51	08:12	08:32
52°	16:43	17:20	18:01	07:48	08:10	08:32
50°	16:49	17:25	18:04	07:44	08:08	08:32
45°	17:04	17:35	18:11	07:36	08:04	08:31
N 40°	17:16	17:44	18:17	07:30	08:01	08:31
35°	17:26	17:53	18:23	07:25	07:58	08:30
30°	17:35	18:00	18:29	07:20	07:55	08:30
20°	17:50	18:13	18:40	07:11	07:51	08:30
N 10°	18:04	18:26	18:51	07:04	07:47	08:29
0°	18:17	18:38	19:04	06:57	07:43	08:29
S 10°	18:30	18:52	19:18	06:49	07:39	08:28
20°	18:44	19:07	19:35	06:42	07:35	08:28
30°	19:00	19:26	19:57	06:33	07:30	08:27
35°	19:09	19:37	20:11	06:28	07:27	08:27
40°	19:20	19:50	20:27	06:22	07:24	08:26
45°	19:33	20:07	20:49	06:15	07:20	08:26
S 50°	19:49	20:27	21:17	06:07	07:16	08:25
52°	19:56	20:37	21:32	06:03	07:14	08:25
54°	20:04	20:48	21:50	05:59	07:11	08:25
56°	20:13	21:01	22:12	05:55	07:09	08:24
58°	20:24	21:17	22:42	05:49	07:06	08:24
S 60°	20:36	21:35	23:38	05:44	07:03	08:24
S 62°	20:50	21:59	-	05:37	06:59	08:23

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON ◯ Age/ Vis
28	12 53	12 58	12:13	00:45	13:09	17d 98%
29	13 04	13 09	12:13	01:32	13:55	18d 94%
30	13 14	13 19	12:13	02:18	14:41	19d 89%

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2013 Jan 31, Feb. 1, 2 (Thur, Fri, Saw)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.5		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
31 Thursday 00	130° 22'.8	190° 51'.2	21° 13'.7 S	159° 29'.6	13° 01'.3 S	65° 48'.6	20° 46'.7 N	270° 48'.5	12° 52'.0 S
01	145° 25'.3	205° 50'.3	13'.2	174° 30'.2	00'.6	80° 51'.1	46'.8	285° 50'.9	52'.0
02	160° 27'.8	220° 49'.5	12'.7	189° 30'.8	12° 59'.9 S	95° 53'.6	46'.8	300° 53'.3	52'.0
03	175° 30'.2	235° 48'.6	12'.1	204° 31'.3	59'.2	110° 56'.0	46'.8	315° 55'.7	52'.0
04	190° 32'.7	250° 47'.8	11'.6	219° 31'.9	58'.5	125° 58'.5	46'.8	330° 58'.1	52'.0
05	205° 35'.1	265° 46'.9	11'.1	234° 32'.5	57'.8	141° 00'.9	46'.8	346° 00'.4	52'.0
06	220° 37'.6	280° 46'.1	10'.6	249° 33'.1	57'.1	156° 03'.4	46'.8	1° 02'.8	52'.0
07	235° 40'.1	295° 45'.2	10'.0	264° 33'.6	56'.4	171° 05'.9	46'.8	16° 05'.2	52'.1
08	250° 42'.5	310° 44'.4	09'.5	279° 34'.2	55'.7	186° 08'.3	46'.8	31° 07'.6	52'.1
09	265° 45'.0	325° 43'.6	09'.0	294° 34'.8	55'.0	201° 10'.8	46'.8	46° 10'.0	52'.1
10	280° 47'.5	340° 42'.7	08'.4	309° 35'.3	54'.3	216° 13'.2	46'.9	61° 12'.4	52'.1
11	295° 49'.9	355° 41'.9	07'.9	324° 35'.9	53'.6	231° 15'.7	46'.9	76° 14'.7	52'.1
12	310° 52'.4	10° 41'.0	21° 07'.4 S	339° 36'.5	12° 52'.9 S	246° 18'.2	20° 46'.9 N	91° 17'.1	12° 52'.1 S
13	325° 54'.9	25° 40'.2	06'.8	354° 37'.0	52'.2	261° 20'.6	46'.9	106° 19'.5	52'.1
14	340° 57'.3	40° 39'.3	06'.3	9° 37'.6	51'.5	276° 23'.1	46'.9	121° 21'.9	52'.2
15	355° 59'.8	55° 38'.5	05'.8	24° 38'.2	50'.8	291° 25'.5	46'.9	136° 24'.3	52'.2
16	11° 02'.2	70° 37'.6	05'.2	39° 38'.7	50'.1	306° 28'.0	46'.9	151° 26'.7	52'.2
17	26° 04'.7	85° 36'.8	04'.7	54° 39'.3	49'.4	321° 30'.4	46'.9	166° 29'.1	52'.2
18	41° 07'.2	100° 35'.9	04'.1	69° 39'.9	48'.7	336° 32'.9	46'.9	181° 31'.4	52'.2
19	56° 09'.6	115° 35'.1	03'.6	84° 40'.5	48'.0	351° 35'.3	47'.0	196° 33'.8	52'.2
20	71° 12'.1	130° 34'.3	03'.1	99° 41'.0	47'.2	6° 37'.8	47'.0	211° 36'.2	52'.2
21	86° 14'.6	145° 33'.4	02'.5	114° 41'.6	46'.5	21° 40'.2	47'.0	226° 38'.6	52'.3
22	101° 17'.0	160° 32'.6	02'.0	129° 42'.2	45'.8	36° 42'.7	47'.0	241° 41'.0	52'.3
23	116° 19'.5	175° 31'.7	01'.4	144° 42'.7	45'.1	51° 45'.2	47'.0	256° 43'.4	52'.3
1 Friday 00	131° 22'.0	190° 30'.9	21° 00'.9 S	159° 43'.3	12° 44'.4 S	66° 47'.6	20° 47'.0 N	271° 45'.8	12° 52'.3 S
01	146° 24'.4	205° 30'.1	00'.3	174° 43'.9	43'.7	81° 50'.1	47'.0	286° 48'.1	52'.3
02	161° 26'.9	220° 29'.2	20° 59'.8 S	189° 44'.5	43'.0	96° 52'.5	47'.0	301° 50'.5	52'.3
03	176° 29'.4	235° 28'.4	59'.2	204° 45'.0	42'.3	111° 55'.0	47'.0	316° 52'.9	52'.3
04	191° 31'.8	250° 27'.5	58'.7	219° 45'.6	41'.6	126° 57'.4	47'.1	331° 55'.3	52'.4
05	206° 34'.3	265° 26'.7	58'.1	234° 46'.2	40'.9	141° 59'.9	47'.1	346° 57'.7	52'.4
06	221° 36'.7	280° 25'.9	57'.6	249° 46'.7	40'.2	157° 02'.3	47'.1	2° 00'.1	52'.4
07	236° 39'.2	295° 25'.0	57'.0	264° 47'.3	39'.5	172° 04'.8	47'.1	17° 02'.5	52'.4
08	251° 41'.7	310° 24'.2	56'.5	279° 47'.9	38'.8	187° 07'.2	47'.1	32° 04'.8	52'.4
09	266° 44'.1	325° 23'.3	55'.9	294° 48'.5	38'.1	202° 09'.7	47'.1	47° 07'.2	52'.4
10	281° 46'.6	340° 22'.5	55'.4	309° 49'.0	37'.4	217° 12'.1	47'.1	62° 09'.6	52'.4
11	296° 49'.1	355° 21'.7	54'.8	324° 49'.6	36'.7	232° 14'.6	47'.1	77° 12'.0	52'.5
12	311° 51'.5	10° 20'.8	20° 54'.2 S	339° 50'.2	12° 36'.0 S	247° 17'.0	20° 47'.2 N	92° 14'.4	12° 52'.5 S
13	326° 54'.0	25° 20'.0	53'.7	354° 50'.8	35'.3	262° 19'.5	47'.2	107° 16'.8	52'.5
14	341° 56'.5	40° 19'.2	53'.1	9° 51'.3	34'.6	277° 21'.9	47'.2	122° 19'.2	52'.5
15	356° 58'.9	55° 18'.3	52'.5	24° 51'.9	33'.8	292° 24'.4	47'.2	137° 21'.6	52'.5
16	12° 01'.4	70° 17'.5	52'.0	39° 52'.5	33'.1	307° 26'.8	47'.2	152° 24'.0	52'.5
17	27° 03'.9	85° 16'.7	51'.4	54° 53'.1	32'.4	322° 29'.2	47'.2	167° 26'.3	52'.5
18	42° 06'.3	100° 15'.8	50'.8	69° 53'.6	31'.7	337° 31'.7	47'.2	182° 28'.7	52'.5
19	57° 08'.8	115° 15'.0	50'.3	84° 54'.2	31'.0	352° 34'.1	47'.2	197° 31'.1	52'.6
20	72° 11'.2	130° 14'.2	49'.7	99° 54'.8	30'.3	7° 36'.6	47'.3	212° 33'.5	52'.6
21	87° 13'.7	145° 13'.3	49'.1	114° 55'.4	29'.6	22° 39'.0	47'.3	227° 35'.9	52'.6
22	102° 16'.2	160° 12'.5	48'.6	129° 55'.9	28'.9	37° 41'.5	47'.3	242° 38'.3	52'.6
23	117° 18'.6	175° 11'.7	48'.0	144° 56'.5	28'.2	52° 43'.9	47'.3	257° 40'.7	52'.6
2 Saturday 00	132° 21'.1	190° 10'.8	20° 47'.4 S	159° 57'.1	12° 27'.5 S	67° 46'.4	20° 47'.3 N	272° 43'.1	12° 52'.6 S
01	147° 23'.6	205° 10'.0	46'.9	174° 57'.7	26'.8	82° 48'.8	47'.3	287° 45'.5	52'.6
02	162° 26'.0	220° 09'.2	46'.3	189° 58'.2	26'.1	97° 51'.2	47'.3	302° 47'.9	52'.6
03	177° 28'.5	235° 08'.3	45'.7	204° 58'.8	25'.3	112° 53'.7	47'.3	317° 50'.2	52'.7
04	192° 31'.0	250° 07'.5	45'.1	219° 59'.4	24'.6	127° 56'.1	47'.4	332° 52'.6	52'.7
05	207° 33'.4	265° 06'.7	44'.5	235° 00'.0	23'.9	142° 58'.6	47'.4	347° 55'.0	52'.7
06	222° 35'.9	280° 05'.9	44'.0	250° 00'.5	23'.2	158° 01'.0	47'.4	2° 57'.4	52'.7
07	237° 38'.3	295° 05'.0	43'.4	265° 01'.1	22'.5	173° 03'.4	47'.4	17° 59'.8	52'.7
08	252° 40'.8	310° 04'.2	42'.8	280° 01'.7	21'.8	188° 05'.9	47'.4	33° 02'.2	52'.7
09	267° 43'.3	325° 03'.4	42'.2	295° 02'.3	21'.1	203° 08'.3	47'.4	48° 04'.6	52'.7
10	282° 45'.7	340° 02'.6	41'.6	310° 02'.9	20'.4	218° 10'.8	47'.4	63° 07'.0	52'.7
11	297° 48'.2	355° 01'.7	41'.1	325° 03'.4	19'.7	233° 13'.2	47'.5	78° 09'.4	52'.8
12	312° 50'.7	10° 00'.9	20° 40'.5 S	340° 04'.0	12° 18'.9 S	248° 15'.6	20° 47'.5 N	93° 11'.8	12° 52'.8 S
13	327° 53'.1	25° 00'.1	39'.9	355° 04'.6	18'.2	263° 18'.1	47'.5	108° 14'.2	52'.8
14	342° 55'.6	39° 59'.3	39'.3	10° 05'.2	17'.5	278° 20'.5	47'.5	123° 16'.6	52'.8
15	357° 58'.1	54° 58'.4	38'.7	25° 05'.7	16'.8	293° 23'.0	47'.5	138° 18'.9	52'.8
16	13° 00'.5	69° 57'.6	38'.1	40° 06'.3	16'.1	308° 25'.4	47'.5	153° 21'.3	52'.8
17	28° 03'.0	84° 56'.8	37'.5	55° 06'.9	15'.4	323° 27'.8	47'.5	168° 23'.7	52'.8
18	43° 05'.5	99° 56'.0	36'.9	70° 07'.5	14'.7	338° 30'.3	47'.6	183° 26'.1	52'.8
19	58° 07'.9	114° 55'.1	36'.3	85° 08'.1	14'.0	353° 32'.7	47'.6	198° 28'.5	52'.9
20	73° 10'.4	129° 54'.3	35'.7	100° 08'.6	13'.2	8° 35'.1	47'.6	213° 30'.9	52'.9
21	88° 12'.8	144° 53'.5	35'.1	115° 09'.2	12'.5	23° 37'.6	47'.6	228° 33'.3	52'.9
22	103° 15'.3	159° 52'.7	34'.5	130° 09'.8	11'.8	38° 40'.0	47'.6	243° 35'.7	52'.9
23	118° 17'.8	174° 51'.8	33'.9	145° 10'.4	11'.1	53° 42'.5	47'.6	258° 38'.1	52'.9
	M.P. 15:12	v -0'.8	d 0'.6	v 0'.6	d 0'.7	v 2'.4	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.5	40° 15'.4 S
Achernar	335° 27'.1	57° 10'.5 S
Acrux	173° 09'.1	63° 10'.2 S
Adhara	255° 12'.4	28° 59'.7 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.7	55° 53'.0 N
Alkaid	152° 59'.0	49° 14'.5 N
Alnair	27° 44'.5	46° 53'.8 S
Alnilam	275° 46'.4	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.3	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.9 N
Altair	62° 08'.8	8° 54'.2 N
Ankaa	353° 16'.2	42° 14'.3 S
Antares	112° 26'.7	26° 27'.5 S
Arcturus	145° 55'.9	19° 06'.7 N
Atria	107° 29'.0	69° 02'.7 S
Avior	234° 17'.4	59° 33'.3 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.8	52° 42'.5 S
Capella	280° 34'.5	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.7 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.5	61° 40'.5 N
Elnath	278° 12'.7	28° 37'.0 N
Eltanin	90° 46'.6	51° 29'.1 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.6	29° 33'.2 S
Gacrux	172° 00'.8	57° 11'.1 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.1	60° 25'.9 S
Hamal	328° 01'.1	23° 31'.5 N
Kaus Aust.	83° 44'.4	34° 22'.5 S
Kochab	137° 20'.1	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.3	4° 08'.4 N
Menkent	148° 07'.8	36° 25'.9 S
Miaplacidus	221° 38'.7	69° 46'.4 S
Mirfak	308° 40'.6	49° 54'.6 N
Nunki	75° 58'.9	26° 16'.7 S
Peacock	53° 20'.2	56° 41'.4 S
Polaris	317° 51'.9	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.2 N
Rasalhague	96° 06'.9	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.1	8° 11'.4 S
Rigil Kent	139° 52'.0	60° 53'.1 S
Sabik	102° 13'.0	15° 44'.4 S
Schedar	349° 41'.0	56° 36'.8 N
Shaula	96° 22'.5	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.3 S
Spica	158° 31'.4	11° 13'.8 S
Suhail	222° 52'.1	43° 29'.3 S
Vega	80° 39'.5	38° 47'.7 N
Zuben'ubi	137° 05'.7	16° 05'.7 S

	SHA	Mer.Pass.
Venus	59° 08'.9	11:19
Mars	28° 21'.4	13:21
Jupiter	295° 25'.6	19:30
Saturn	140° 23'.8	05:52

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
176° 39'.2	17° 23'.6 S	315° 22'.4	12'.5	2° 22'.6 S	11'.6	57'.1
191° 39'.1	22'.9	329° 53'.9	12'.5	34'.2	11'.6	
206° 39'.0	22'.2	344° 25'.4	12'.5	45'.8	11'.6	
221° 38'.9	21'.5	358° 56'.9	12'.4	57'.4	11'.5	57'.2
236° 38'.8	20'.8	13° 28'.3	12'.4	3° 08'.9 S	11'.6	
251° 38'.7	20'.1	27° 59'.7	12'.4	20'.5	11'.6	
266° 38'.6	19'.4	42° 31'.1	12'.4	32'.1	11'.5	
281° 38'.5	18'.7	57° 02'.5	12'.3	43'.6	11'.6	57'.3
296° 38'.4	18'.0	71° 33'.8	12'.3	55'.2	11'.5	
311° 38'.4	17'.3	86° 05'.1	12'.2	4° 06'.7 S	11'.5	
326° 38'.3	16'.6	100° 36'.3	12'.2	18'.2	11'.5	
341° 38'.2	15'.9	115° 07'.5	12'.2	29'.7	11'.5	
356° 38'.1	17° 15'.2 S	129° 38'.7	12'.1	4° 41'.2 S	11'.5	57'.4
11° 38'.0	14'.5	144° 09'.8	12'.1	52'.7	11'.5	
26° 37'.9	13'.8	158° 40'.9	12'.1	5° 04'.2 S	11'.4	
41° 37'.8	13'.1	173° 12'.0	12'.0	15'.6	11'.4	
56° 37'.7	12'.4	187° 43'.0	12'.0	27'.0	11'.4	
71° 37'.7	11'.7	202° 14'.0	11'.9	38'.4	11'.4	57'.5
86° 37'.6	11'.0	216° 44'.9	11'.9	49'.8	11'.4	
101° 37'.5	10'.3	231° 15'.8	11'.8	6° 01'.2 S	11'.3	
116° 37'.4	09'.6	245° 46'.6	11'.8	12'.5	11'.3	
131° 37'.3	08'.8	260° 17'.4	11'.8	23'.8	11'.3	
146° 37'.2	08'.1	274° 48'.2	11'.7	35'.1	11'.2	57'.6
161° 37'.1	07'.4	289° 18'.9	11'.7	46'.3	11'.3	
176° 37'.1	17° 06'.7 S	303° 49'.6	11'.6	6° 57'.6 S	11'.2	57'.6
191° 37'.0	06'.0	318° 20'.2	11'.6	7° 08'.8 S	11'.2	
206° 36'.9	05'.3	332° 50'.8	11'.5	20'.0	11'.1	
221° 36'.8	04'.6	347° 21'.3	11'.5	31'.1	11'.1	57'.7
236° 36'.7	03'.9	1° 51'.8	11'.5	42'.2	11'.1	
251° 36'.6	03'.2	16° 22'.3	11'.3	53'.3	11'.0	
266° 36'.6	02'.4	30° 52'.6	11'.4	8° 04'.3 S	11'.0	
281° 36'.5	01'.7	45° 23'.0	11'.3	15'.3	11'.0	57'.8
296° 36'.4	01'.0	59° 53'.3	11'.2	26'.3	11'.0	
311° 36'.3	00'.3	74° 23'.5	11'.2	37'.3	10'.9	
326° 36'.2	16° 59'.6 S	88° 53'.7	11'.1	48'.2	10'.8	
341° 36'.2	58'.9	103° 23'.8	11'.1	59'.0	10'.8	
356° 36'.1	16° 58'.2 S	117° 53'.9	11'.0	9° 09'.8 S	10'.8	57'.9
11° 36'.0	57'.4	132° 23'.9	11'.0	20'.6	10'.8	
26° 35'.9	56'.7	146° 53'.9	10'.9	31'.4	10'.6	
41° 35'.8	56'.0	161° 23'.8	10'.8	42'.0	10'.7	
56° 35'.8	55'.3	175° 53'.6	10'.8	52'.7	10'.6	
71° 35'.7	54'.6	190° 23'.4	10'.8	10° 03'.3 S	10'.6	58'.0
86° 35'.6	53'.8	204° 53'.2	10'.6	13'.9	10'.5	
101° 35'.5	53'.1	219° 22'.8	10'.7	24'.4	10'.4	
116° 35'.4	52'.4	233° 52'.5	10'.5	34'.8	10'.4	
131° 35'.4	51'.7	248° 22'.0	10'.5	45'.2	10'.4	
146° 35'.3	51'.0	262° 51'.5	10'.5	55'.6	10'.3	58'.1
161° 35'.2	50'.2	277° 21'.0	10'.4	11° 05'.9 S	10'.3	
176° 35'.1	16° 49'.5 S	291° 50'.4	10'.3	11° 16'.2 S	10'.2	58'.1
191° 35'.1	48'.8	306° 19'.7	10'.2	26'.4	10'.1	
206° 35'.0	48'.1	320° 48'.9	10'.2	36'.5	10'.1	58'.2
221° 34'.9	47'.3	335° 18'.1	10'.2	46'.6	10'.0	
236° 34'.8	46'.6	349° 47'.3	10'.0	56'.6	10'.0	
251° 34'.8	45'.9	4° 16'.3	10'.0	12° 06'.6 S	9'.9	
266° 34'.7	45'.2	18° 45'.3	10'.0	16'.5	9'.9	
281° 34'.6	44'.4	33° 14'.3	9'.9	26'.4	9'.7	58'.3
296° 34'.5	43'.7	47° 43'.2	9'.8	36'.1	9'.8	
311° 34'.5	43'.0	62° 12'.0	9'.7	45'.9	9'.6	
326° 34'.4	42'.3	76° 40'.7	9'.7	55'.5	9'.6	
341° 34'.3	41'.5	91° 09'.4	9'.6	13° 05'.1 S	9'.5	
356° 34'.3	16° 40'.8 S	105° 38'.0	9'.5	13° 14'.6 S	9'.5	58'.4
11° 34'.2	40'.1	120° 06'.5	9'.5	24'.1	9'.4	
26° 34'.1	39'.3	134° 35'.0	9'.4	33'.5	9'.3	
41° 34'.0	38'.6	149° 03'.4	9'.4	42'.8	9'.2	
56° 34'.0	37'.9	163° 31'.8	9'.3	52'.0	9'.2	
71° 33'.9	37'.2	178° 00'.1	9'.2	14° 01'.2 S	9'.1	58'.5
86° 33'.8	36'.4	192° 28'.3	9'.1	10'.3	9'.0	
101° 33'.8	35'.7	206° 56'.4	9'.1	19'.3	9'.0	
116° 33'.7	35'.0	221° 24'.5	9'.0	28'.3	8'.9	
131° 33'.6	34'.2	235° 52'.5	8'.9	37'.2	8'.8	
146° 33'.6	33'.5	250° 20'.4	8'.9	46'.0	8'.7	58'.6
161° 33'.5	32'.8	264° 48'.3	8'.7	54'.7	8'.6	
SD 16'.2	d 0'.7	SD	15'.6	15'.8	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 31	Moonrise 1	Moonrise 2
N 72°	07:09	08:38	10:26	23:11	-	01:12
N 70°	07:01	08:19	09:44	23:01	-	00:51
68°	06:54	08:05	09:17	22:52	-	00:35
66°	06:49	07:53	08:56	22:45	-	00:22
64°	06:44	07:42	08:39	22:39	-	00:11
62°	06:40	07:34	08:25	22:34	-	00:02
60°	06:36	07:26	08:13	22:30	23:54	25:20
N 58°	06:32	07:20	08:03	22:26	23:47	25:10
56°	06:29	07:13	07:55	22:22	23:41	25:01
54°	06:25	07:08	07:47	22:19	23:36	24:54
52°	06:23	07:03	07:40	22:16	23:31	24:47
50°	06:20	06:59	07:33	22:14	23:27	24:41
45°	06:13	06:48	07:20	22:08	23:17	24:27
N 40°	06:07	06:40	07:08	22:04	23:10	24:17
35°	06:02	06:32	06:59	22:00	23:03	24:07
30°	05:57	06:25	06:50	21:57	22:57	23:59
20°	05:46	06:12	06:35	21:51	22:47	23:45
N 10°	05:35	06:00	06:22	21:45	22:38	23:33
0°	05:23	05:48	06:10	21:41	22:30	23:22
S 10°	05:10	05:36	05:58	21:36	22:22	23:11
20°	04:53	05:21	05:44	21:31	22:13	22:59
30°	04:32	05:03	05:29	21:25	22:04	22:46
35°	04:19	04:52	05:20	21:22	21:58	22:38
40°	04:02	04:39	05:09	21:18	21:52	22:29
45°	03:42	04:24	04:57	21:14	21:45	22:19
S 50°	03:14	04:04	04:42	21:09	21:36	22:07
52°	03:00	03:54	04:35	21:07	21:32	22:01
54°	02:44	03:44	04:27	21:04	21:27	21:55
56°	02:23	03:31	04:18	21:02	21:23	21:48
58°	01:56	03:17	04:08	20:58	21:17	21:40
S 60°	01:12	02:59	03:57	20:55	21:11	21:31
S 62°	-	02:37	03:43	20:51	21:04	21:21

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 31	Moonset 1	Moonset 2
N 72°	14:03	15:51	17:20	08:23	08:10	07:53
N 70°	14:44	16:09	17:28	08:29	08:22	08:15
68°	15:12	16:24	17:34	08:33	08:33	08:33
66°	15:33	16:36	17:40	08:37	08:41	08:47
64°	15:49	16:46	17:44	08:40	08:49	08:59
62°	16:03	16:54	17:49	08:43	08:55	09:09
60°	16:15	17:02	17:53	08:46	09:00	09:18
N 58°	16:25	17:09	17:56	08:48	09:05	09:25
56°	16:33	17:14	17:59	08:50	09:10	09:32
54°	16:41	17:20	18:03	08:52	09:14	09:38
52°	16:48	17:25	18:05	08:54	09:17	09:44
50°	16:54	17:29	18:08	08:55	09:20	09:49
45°	17:08	17:39	18:14	08:58	09:27	09:59
N 40°	17:19	17:48	18:20	09:01	09:33	10:08
35°	17:29	17:55	18:26	09:04	09:38	10:16
30°	17:37	18:02	18:31	09:06	09:43	10:23
20°	17:52	18:15	18:41	09:09	09:51	10:35
N 10°	18:05	18:27	18:52	09:13	09:58	10:45
0°	18:17	18:39	19:04	09:16	10:04	10:55
S 10°	18:29	18:51	19:17	09:19	10:10	11:04
20°	18:43	19:06	19:34	09:22	10:17	11:15
30°	18:58	19:24	19:54	09:26	10:25	11:27
35°	19:07	19:35	20:08	09:28	10:30	11:34
40°	19:17	19:47	20:24	09:30	10:35	11:41
45°	19:29	20:03	20:44	09:33	10:41	11:51
S 50°	19:44	20:22	21:11	09:36	10:48	12:02
52°	19:51	20:31	21:25	09:38	10:52	12:07
54°	19:59	20:42	21:41	09:39	10:56	12:13
56°	20:08	20:54	22:01	09:41	11:00	12:19
58°	20:17	21:09	22:27	09:43	11:04	12:26
S 60°	20:29	21:26	23:07	09:46	11:09	12:34
S 62°	20:42	21:47	-	09:48	11:15	12:44

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
31	13 23	13 27	12:13	03:04	15:28	20d 81%
1	13 32	13 36	12:14	03:52	16:17	21d 72%
2	13 39	13 43	12:14	04:42	17:08	22d 62%

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2013 February 3, 4, 5 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.5		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
3 Sunday 00	133° 20'.2	189° 51'.0	20° 33'.4 S	160° 11'.0	12° 10'.4 S	68° 44'.9	20° 47'.6 N	273° 40'.5	12° 52'.9 S
01	148° 22'.7	204° 50'.2	32'.8	175° 11'.5	09'.7	83° 47'.3	47'.7	288° 42'.9	52'.9
02	163° 25'.2	219° 49'.4	32'.1	190° 12'.1	09'.0	98° 49'.8	47'.7	303° 45'.3	52'.9
03	178° 27'.6	234° 48'.6	31'.5	205° 12'.7	08'.2	113° 52'.2	47'.7	318° 47'.7	52'.9
04	193° 30'.1	249° 47'.8	30'.9	220° 13'.3	07'.5	128° 54'.6	47'.7	333° 50'.1	53'.0
05	208° 32'.6	264° 46'.9	30'.3	235° 13'.9	06'.8	143° 57'.1	47'.7	348° 52'.5	53'.0
06	223° 35'.0	279° 46'.1	29'.7	250° 14'.4	06'.1	158° 59'.5	47'.7	3° 54'.9	53'.0
07	238° 37'.5	294° 45'.3	29'.1	265° 15'.0	05'.4	174° 01'.9	47'.7	18° 57'.3	53'.0
08	253° 40'.0	309° 44'.5	28'.5	280° 15'.6	04'.7	189° 04'.3	47'.8	33° 59'.6	53'.0
09	268° 42'.4	324° 43'.7	27'.9	295° 16'.2	04'.0	204° 06'.8	47'.8	49° 02'.0	53'.0
10	283° 44'.9	339° 42'.8	27'.3	310° 16'.8	03'.2	219° 09'.2	47'.8	64° 04'.4	53'.0
11	298° 47'.3	354° 42'.0	26'.7	325° 17'.3	02'.5	234° 11'.6	47'.8	79° 06'.8	53'.0
12	313° 49'.8	9° 41'.2	20° 26'.1 S	340° 17'.9	12° 01'.8 S	249° 14'.1	20° 47'.8 N	94° 09'.2	12° 53'.0 S
13	328° 52'.3	24° 40'.4	25'.5	355° 18'.5	01'.1	264° 16'.5	47'.8	109° 11'.6	53'.1
14	343° 54'.7	39° 39'.6	24'.9	10° 19'.1	00'.4	279° 18'.9	47'.9	124° 14'.0	53'.1
15	358° 57'.2	54° 38'.8	24'.2	25° 19'.7	11° 59'.7 S	294° 21'.4	47'.9	139° 16'.4	53'.1
16	13° 59'.7	69° 38'.0	23'.6	40° 20'.3	58'.9	309° 23'.8	47'.9	154° 18'.8	53'.1
17	29° 02'.1	84° 37'.1	23'.0	55° 20'.8	58'.2	324° 26'.2	47'.9	169° 21'.2	53'.1
18	44° 04'.6	99° 36'.3	22'.4	70° 21'.4	57'.5	339° 28'.6	47'.9	184° 23'.6	53'.1
19	59° 07'.1	114° 35'.5	21'.8	85° 22'.0	56'.8	354° 31'.1	47'.9	199° 26'.0	53'.1
20	74° 09'.5	129° 34'.7	21'.2	100° 22'.6	56'.1	9° 33'.5	47'.9	214° 28'.4	53'.1
21	89° 12'.0	144° 33'.9	20'.5	115° 23'.2	55'.3	24° 35'.9	48'.0	229° 30'.8	53'.1
22	104° 14'.4	159° 33'.1	19'.9	130° 23'.8	54'.6	39° 38'.4	48'.0	244° 33'.2	53'.1
23	119° 16'.9	174° 32'.3	19'.3	145° 24'.3	53'.9	54° 40'.8	48'.0	259° 35'.6	53'.2
4 Monday 00	134° 19'.4	189° 31'.5	20° 18'.7 S	160° 24'.9	11° 53'.2 S	69° 43'.2	20° 48'.0 N	274° 38'.0	12° 53'.2 S
01	149° 21'.8	204° 30'.7	18'.0	175° 25'.5	52'.5	84° 45'.6	48'.0	289° 40'.4	53'.2
02	164° 24'.3	219° 29'.9	17'.4	190° 26'.1	51'.8	99° 48'.1	48'.0	304° 42'.8	53'.2
03	179° 26'.8	234° 29'.0	16'.8	205° 26'.7	51'.0	114° 50'.5	48'.1	319° 45'.2	53'.2
04	194° 29'.2	249° 28'.2	16'.2	220° 27'.3	50'.3	129° 52'.9	48'.1	334° 47'.6	53'.2
05	209° 31'.7	264° 27'.4	15'.5	235° 27'.8	49'.6	144° 55'.3	48'.1	349° 50'.0	53'.2
06	224° 34'.2	279° 26'.6	14'.9	250° 28'.4	48'.9	159° 57'.8	48'.1	4° 52'.4	53'.2
07	239° 36'.6	294° 25'.8	14'.3	265° 29'.0	48'.2	175° 00'.2	48'.1	19° 54'.8	53'.2
08	254° 39'.1	309° 25'.0	13'.6	280° 29'.6	47'.4	190° 02'.6	48'.1	34° 57'.2	53'.2
09	269° 41'.6	324° 24'.2	13'.0	295° 30'.2	46'.7	205° 05'.0	48'.2	49° 59'.6	53'.3
10	284° 44'.0	339° 23'.4	12'.4	310° 30'.8	46'.0	220° 07'.4	48'.2	65° 02'.0	53'.3
11	299° 46'.5	354° 22'.6	11'.7	325° 31'.4	45'.3	235° 09'.9	48'.2	80° 04'.4	53'.3
12	314° 48'.9	9° 21'.8	20° 11'.1 S	340° 31'.9	11° 44'.5 S	250° 12'.3	20° 48'.2 N	95° 06'.8	12° 53'.3 S
13	329° 51'.4	24° 21'.0	10'.5	355° 32'.5	43'.8	265° 14'.7	48'.2	110° 09'.2	53'.3
14	344° 53'.9	39° 20'.2	09'.8	10° 33'.1	43'.1	280° 17'.1	48'.2	125° 11'.6	53'.3
15	359° 56'.3	54° 19'.4	09'.2	25° 33'.7	42'.4	295° 19'.5	48'.3	140° 14'.0	53'.3
16	14° 58'.8	69° 18'.6	08'.5	40° 34'.3	41'.7	310° 22'.0	48'.3	155° 16'.4	53'.3
17	30° 01'.3	84° 17'.8	07'.9	55° 34'.9	40'.9	325° 24'.4	48'.3	170° 18'.8	53'.3
18	45° 03'.7	99° 17'.0	07'.3	70° 35'.5	40'.2	340° 26'.8	48'.3	185° 21'.2	53'.3
19	60° 06'.2	114° 16'.2	06'.6	85° 36'.1	39'.5	355° 29'.2	48'.3	200° 23'.6	53'.4
20	75° 08'.7	129° 15'.4	06'.0	100° 36'.6	38'.8	10° 31'.6	48'.3	215° 26'.0	53'.4
21	90° 11'.1	144° 14'.6	05'.3	115° 37'.2	38'.0	25° 34'.1	48'.4	230° 28'.4	53'.4
22	105° 13'.6	159° 13'.8	04'.7	130° 37'.8	37'.3	40° 36'.5	48'.4	245° 30'.8	53'.4
23	120° 16'.1	174° 13'.0	04'.0	145° 38'.4	36'.6	55° 38'.9	48'.4	260° 33'.2	53'.4
5 Tuesday 00	135° 18'.5	189° 12'.2	20° 03'.4 S	160° 39'.0	11° 35'.9 S	70° 41'.3	20° 48'.4 N	275° 35'.6	12° 53'.4 S
01	150° 21'.0	204° 11'.4	02'.7	175° 39'.6	35'.2	85° 43'.7	48'.4	290° 38'.0	53'.4
02	165° 23'.4	219° 10'.6	02'.1	190° 40'.2	34'.4	100° 46'.1	48'.4	305° 40'.4	53'.4
03	180° 25'.9	234° 09'.8	01'.4	205° 40'.8	33'.7	115° 48'.6	48'.5	320° 42'.8	53'.4
04	195° 28'.4	249° 09'.0	00'.8	220° 41'.3	33'.0	130° 51'.0	48'.5	335° 45'.2	53'.4
05	210° 30'.8	264° 08'.2	00'.1	235° 41'.9	32'.3	145° 53'.4	48'.5	350° 47'.6	53'.4
06	225° 33'.3	279° 07'.4	19° 59'.5 S	250° 42'.5	31'.5	160° 55'.8	48'.5	5° 50'.0	53'.4
07	240° 35'.8	294° 06'.6	58'.8	265° 43'.1	30'.8	175° 58'.2	48'.5	20° 52'.4	53'.5
08	255° 38'.2	309° 05'.8	58'.2	280° 43'.7	30'.1	191° 00'.6	48'.5	35° 54'.8	53'.5
09	270° 40'.7	324° 05'.0	57'.5	295° 44'.3	29'.4	206° 03'.0	48'.6	50° 57'.2	53'.5
10	285° 43'.2	339° 04'.2	56'.8	310° 44'.9	28'.6	221° 05'.5	48'.6	65° 59'.6	53'.5
11	300° 45'.6	354° 03'.4	56'.2	325° 45'.5	27'.9	236° 07'.9	48'.6	81° 02'.1	53'.5
12	315° 48'.1	9° 02'.6	19° 55'.5 S	340° 46'.1	11° 27'.2 S	251° 10'.3	20° 48'.6 N	96° 04'.5	12° 53'.5 S
13	330° 50'.6	24° 01'.8	54'.9	355° 46'.7	26'.5	266° 12'.7	48'.6	111° 06'.9	53'.5
14	345° 53'.0	39° 01'.0	54'.2	10° 47'.2	25'.7	281° 15'.1	48'.7	126° 09'.3	53'.5
15	0° 55'.5	54° 00'.3	53'.5	25° 47'.8	25'.0	296° 17'.5	48'.7	141° 11'.7	53'.5
16	15° 57'.9	68° 59'.5	52'.9	40° 48'.4	24'.3	311° 19'.9	48'.7	156° 14'.1	53'.5
17	31° 00'.4	83° 58'.7	52'.2	55° 49'.0	23'.6	326° 22'.3	48'.7	171° 16'.5	53'.5
18	46° 02'.9	98° 57'.9	51'.5	70° 49'.6	22'.8	341° 24'.7	48'.7	186° 18'.9	53'.5
19	61° 05'.3	113° 57'.1	50'.9	85° 50'.2	22'.1	356° 27'.2	48'.7	201° 21'.3	53'.6
20	76° 07'.8	128° 56'.3	50'.2	100° 50'.8	21'.4	11° 29'.6	48'.8	216° 23'.7	53'.6
21	91° 10'.3	143° 55'.5	49'.5	115° 51'.4	20'.6	26° 32'.0	48'.8	231° 26'.1	53'.6
22	106° 12'.7	158° 54'.7	48'.8	130° 52'.0	19'.9	41° 34'.4	48'.8	246° 28'.5	53'.6
23	121° 15'.2	173° 53'.9	48'.2	145° 52'.6	19'.2	56° 36'.8	48'.8	261° 30'.9	53'.6
	M.P. 15:00	v -0'.8	d 0'.6	v 0'.6	d 0'.7	v 2'.4	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.5	40° 15'.4 S
Achernar	335° 27'.2	57° 10'.5 S
Acrux	173° 09'.1	63° 10'.2 S
Adhara	255° 12'.4	28° 59'.7 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.6	55° 53'.0 N
Alkaid	152° 58'.9	49° 14'.5 N
Alnair	27° 44'.5	46° 53'.8 S
Alnilam	275° 46'.4	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.3	26° 40'.1 N
Alpheratz	357° 44'.0	29° 09'.9 N
Altair	62° 08'.8	8° 54'.2 N
Ankaa	353° 16'.2	42° 14'.3 S
Antares	112° 26'.7	26° 27'.5 S
Arcturus	145° 55'.9	19° 06'.7 N
Atria	107° 29'.0	69° 02'.7 S
Avior	234° 17'.4	59° 33'.3 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.4 N
Canopus	263° 55'.8	52° 42'.5 S
Capella	280° 34'.5	46° 00'.6 N
Deneb	49° 32'.1	45° 19'.7 N
Denebola	182° 33'.6	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.4	61° 40'.5 N
Elnath	278° 12'.7	28° 37'.0 N
Eltanin	90° 46'.6	51° 29'.1 N
Enif	33° 47'.7	9° 56'.2 N
Fomalhaut	15° 24'.6	29° 33'.2 S
Gacrux	172° 00'.8	57° 11'.1 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.0	60° 25'.9 S
Hamal	328° 01'.1	23° 31'.5 N
Kaus Aust.	83° 44'.4	34° 22'.5 S
Kochab	137° 20'.1	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.3	4° 08'.4 N
Menkent	148° 07'.7	36° 25'.9 S
Miaplacidus	221° 38'.7	69° 46'.4 S
Mirfak	308° 40'.6	49° 54'.6 N
Nunki	75° 58'.9	26° 16'.7 S
Peacock	53° 20'.2	56° 41'.4 S
Polaris	317° 53'.2	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.2 N
Rasalhague	96° 06'.9	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.1	8° 11'.5 S
Rigil Kent	139° 51'.9	60° 53'.1 S
Sabik	102° 13'.0	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.8 N
Shaula	96° 22'.5	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.4 S
Spica	158° 31'.4	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.3 S
Vega	80° 39'.5	38° 47'.7 N
Zuben'ubi	137° 05'.7	16° 05'.7 S

	SHA	Mer.Pass.
Venus	55° 12'.1	11:23
Mars	26° 05'.5	13:18
Jupiter	295° 23'.8	19:18
Saturn	140° 18'.6	05:41

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
176° 33'.4	16° 32'.0 S	279° 16'.0	8'.8	15° 03'.3 S	8'.5	58'.6
191° 33'.4	31'.3	293° 43'.8	8'.6	11'.8	8'.5	
206° 33'.3	30'.5	308° 11'.4	8'.6	20'.3	8'.4	
221° 33'.2	29'.8	322° 39'.0	8'.5	28'.7	8'.3	58'.7
236° 33'.2	29'.1	337° 06'.5	8'.4	37'.0	8'.2	
251° 33'.1	28'.3	351° 33'.9	8'.4	45'.2	8'.1	
266° 33'.0	27'.6	6° 01'.3	8'.3	53'.3	8'.0	
281° 33'.0	26'.9	20° 28'.6	8'.2	16° 01'.3 S	8'.0	
296° 32'.9	26'.1	34° 55'.8	8'.2	09'.3	7'.8	58'.8
311° 32'.8	25'.4	49° 23'.0	8'.1	17'.1	7'.8	
326° 32'.8	24'.6	63° 50'.1	8'.0	24'.9	7'.6	
341° 32'.7	23'.9	78° 17'.1	7'.9	32'.5	7'.6	
356° 32'.6	16° 23'.2 S	92° 44'.0	7'.9	16° 40'.1 S	7'.5	58'.8
11° 32'.6	22'.4	107° 10'.9	7'.8	47'.6	7'.4	58'.9
26° 32'.5	21'.7	121° 37'.7	7'.8	55'.0	7'.2	
41° 32'.5	20'.9	136° 04'.5	7'.6	17° 02'.2 S	7'.2	
56° 32'.4	20'.2	150° 31'.1	7'.6	09'.4	7'.1	
71° 32'.3	19'.4	164° 57'.7	7'.5	16'.5	7'.0	
86° 32'.3	18'.7	179° 24'.2	7'.5	23'.5	6'.8	59'.0
101° 32'.2	18'.0	193° 50'.7	7'.4	30'.3	6'.8	
116° 32'.1	17'.2	208° 17'.1	7'.3	37'.1	6'.7	
131° 32'.1	16'.5	222° 43'.4	7'.3	43'.8	6'.5	
146° 32'.0	15'.7	237° 09'.7	7'.1	50'.3	6'.5	
161° 32'.0	15'.0	251° 35'.8	7'.2	56'.8	6'.3	59'.1
176° 31'.9	16° 14'.2 S	266° 02'.0	7'.0	18° 03'.1 S	6'.2	59'.1
191° 31'.8	13'.5	280° 28'.0	7'.0	09'.3	6'.2	
206° 31'.8	12'.7	294° 54'.0	6'.9	15'.5	6'.0	
221° 31'.7	12'.0	309° 19'.9	6'.9	21'.5	5'.9	
236° 31'.7	11'.2	323° 45'.8	6'.7	27'.4	5'.8	59'.2
251° 31'.6	10'.5	338° 11'.5	6'.8	33'.2	5'.6	
266° 31'.6	09'.7	352° 37'.3	6'.6	38'.8	5'.6	
281° 31'.5	09'.0	7° 02'.9	6'.6	44'.4	5'.4	
296° 31'.4	08'.2	21° 28'.5	6'.5	49'.8	5'.3	
311° 31'.4	07'.5	35° 54'.0	6'.5	55'.1	5'.2	
326° 31'.3	06'.7	50° 19'.5	6'.4	19° 00'.3 S	5'.1	59'.3
341° 31'.3	06'.0	64° 44'.9	6'.4	05'.4	5'.0	
356° 31'.2	16° 05'.2 S	79° 10'.3	6'.3	19° 10'.4 S	4'.8	59'.3
11° 31'.2	04'.5	93° 35'.6	6'.2	15'.2	4'.7	
26° 31'.1	03'.7	108° 00'.8	6'.2	19'.9	4'.6	
41° 31'.1	03'.0	122° 26'.0	6'.1	24'.5	4'.5	
56° 31'.0	02'.2	136° 51'.1	6'.0	29'.0	4'.4	59'.4
71° 31'.0	01'.5	151° 16'.1	6'.0	33'.4	4'.2	
86° 30'.9	00'.7	165° 41'.1	6'.0	37'.6	4'.1	
101° 30'.8	16° 00'.0 S	180° 06'.1	5'.9	41'.7	3'.9	
116° 30'.8	59'.2	194° 31'.0	5'.8	45'.6	3'.9	
131° 30'.7	58'.4	208° 55'.8	5'.8	49'.5	3'.7	
146° 30'.7	57'.7	223° 20'.6	5'.7	53'.2	3'.6	59'.5
161° 30'.6	56'.9	237° 45'.3	5'.7	56'.8	3'.4	
176° 30'.6	15° 56'.2 S	252° 10'.0	5'.6	20° 00'.2 S	3'.3	59'.5
191° 30'.5	55'.4	266° 34'.6	5'.6	03'.5	3'.2	
206° 30'.5	54'.6	280° 59'.2	5'.6	06'.7	3'.1	
221° 30'.4	53'.9	295° 23'.8	5'.5	09'.8	2'.9	
236° 30'.4	53'.1	309° 48'.3	5'.4	12'.7	2'.8	59'.6
251° 30'.3	52'.4	324° 12'.7	5'.4	15'.5	2'.6	
266° 30'.3	51'.6	338° 37'.1	5'.4	18'.1	2'.5	
281° 30'.2	50'.8	353° 01'.5	5'.3	20'.6	2'.4	
296° 30'.2	50'.1	7° 25'.8	5'.3	23'.0	2'.2	
311° 30'.1	49'.3	21° 50'.1	5'.3	25'.2	2'.1	
326° 30'.1	48'.6	36° 14'.4	5'.2	27'.3	2'.0	
341° 30'.0	47'.8	50° 38'.6	5'.2	29'.3	1'.8	59'.7
356° 30'.0	15° 47'.0 S	65° 02'.8	5'.1	20° 31'.1 S	1'.7	59'.7
11° 30'.0	46'.3	79° 26'.9	5'.1	32'.8	1'.6	
26° 29'.9	45'.5	93° 51'.0	5'.1	34'.4	1'.4	
41° 29'.9	44'.7	108° 15'.1	5'.1	35'.8	1'.2	
56° 29'.8	44'.0	122° 39'.2	5'.0	37'.0	1'.2	
71° 29'.8	43'.2	137° 03'.2	5'.0	38'.2	0'.9	
86° 29'.7	42'.4	151° 27'.2	4'.9	39'.1	0'.9	
101° 29'.7	41'.7	165° 51'.1	5'.0	40'.0	0'.7	59'.8
116° 29'.6	40'.9	180° 15'.1	4'.9	40'.7	0'.5	
131° 29'.6	40'.1	194° 39'.0	4'.9	41'.2	0'.5	
146° 29'.5	39'.4	209° 02'.9	4'.9	41'.7	0'.2	
161° 29'.5	38'.6	223° 26'.8	4'.9	41'.9	0'.2	
SD 16'.2	d 0'.8	SD 16'.0		16'.2	16'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5
N 72°	06:58	08:24	10:02	03:30	-	-
N 70°	06:51	08:08	09:28	02:49	05:01	-
68°	06:46	07:55	09:04	02:22	04:12	05:55
66°	06:41	07:44	08:45	02:01	03:40	05:11
64°	06:37	07:35	08:30	01:45	03:17	04:41
62°	06:33	07:27	08:17	01:31	02:59	04:19
60°	06:30	07:20	08:06	01:20	02:44	04:01
N 58°	06:27	07:14	07:57	01:10	02:31	03:46
56°	06:24	07:08	07:49	01:01	02:20	03:33
54°	06:21	07:03	07:41	00:54	02:10	03:22
52°	06:18	06:59	07:35	00:47	02:02	03:12
50°	06:16	06:54	07:29	00:41	01:54	03:04
45°	06:10	06:45	07:16	00:27	01:37	02:45
N 40°	06:05	06:37	07:05	00:17	01:24	02:30
35°	06:00	06:30	06:56	00:07	01:13	02:17
30°	05:55	06:23	06:48	-	01:03	02:06
20°	05:45	06:12	06:34	-	00:46	01:47
N 10°	05:35	06:00	06:22	-	00:31	01:30
0°	05:24	05:49	06:10	-	00:17	01:15
S 10°	05:11	05:37	05:59	-	00:03	01:00
20°	04:55	05:23	05:46	23:49	-	00:43
30°	04:35	05:06	05:31	23:32	-	00:24
35°	04:22	04:55	05:23	23:23	-	00:14
40°	04:07	04:43	05:13	23:12	-	00:01
45°	03:47	04:28	05:01	22:59	23:46	24:43
S 50°	03:22	04:10	04:47	22:43	23:29	24:24
52°	03:09	04:01	04:41	22:36	23:20	24:15
54°	02:53	03:51	04:33	22:28	23:11	24:05
56°	02:34	03:39	04:25	22:19	23:00	23:54
58°	02:10	03:26	04:16	22:09	22:48	23:41
S 60°	01:36	03:09	04:05	21:57	22:34	23:26
S 62°	-	02:49	03:53	21:44	22:18	23:07

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 3	Moonset 4	Moonset 5
N 72°	14:27	16:05	17:32	07:25	-	-
N 70°	15:01	16:21	17:38	08:06	07:51	-
68°	15:25	16:34	17:43	08:35	08:41	08:59
66°	15:44	16:45	17:48	08:56	09:13	09:44
64°	15:59	16:54	17:52	09:14	09:36	10:14
62°	16:12	17:02	17:56	09:28	09:55	10:36
60°	16:22	17:09	17:59	09:40	10:11	10:54
N 58°	16:32	17:15	18:02	09:51	10:24	11:09
56°	16:40	17:20	18:05	10:00	10:36	11:22
54°	16:47	17:25	18:08	10:08	10:46	11:34
52°	16:54	17:30	18:10	10:15	10:54	11:43
50°	17:00	17:34	18:13	10:22	11:03	11:52
45°	17:12	17:43	18:18	10:36	11:20	12:11
N 40°	17:23	17:51	18:23	10:48	11:34	12:27
35°	17:32	17:58	18:28	10:58	11:46	12:40
30°	17:40	18:05	18:33	11:07	11:56	12:51
20°	17:54	18:17	18:43	11:22	12:14	13:11
N 10°	18:06	18:28	18:53	11:35	12:30	13:27
0°	18:17	18:39	19:04	11:48	12:44	13:43
S 10°	18:29	18:51	19:17	12:01	12:59	13:59
20°	18:42	19:05	19:32	12:14	13:15	14:16
30°	18:56	19:22	19:52	12:29	13:33	14:35
35°	19:05	19:32	20:05	12:38	13:43	14:47
40°	19:14	19:44	20:20	12:49	13:55	15:00
45°	19:26	19:58	20:39	13:01	14:10	15:15
S 50°	19:40	20:17	21:05	13:15	14:27	15:34
52°	19:46	20:26	21:17	13:22	14:35	15:43
54°	19:53	20:35	21:32	13:30	14:44	15:52
56°	20:01	20:47	21:51	13:38	14:55	16:04
58°	20:11	21:00	22:14	13:48	15:06	16:17
S 60°	20:21	21:16	22:46	13:59	15:20	16:32
S 62°	20:33	21:35	23:58	14:12	15:36	16:50

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
3	13 46	13 49	12:14	05:35	18:02	23d 51%
4	13 52	13 55	12:14	06:31	19:00	24d 40%
5	13 58	14 00	12:14	07:29	19:59	25d 29%

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2013 February 6, 7, 8 (Wed, Thur, Fri)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.5		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
6 Wednesday 00	136° 17'.7	188° 53'.1	19° 47'.5 S	160° 53'.2	11° 18'.5 S	71° 39'.2	20° 48'.8 N	276° 33'.3	12° 53'.6 S
01	151° 20'.1	203° 52'.4	46'.8	175° 53'.7	17'.7	86° 41'.6	48'.9	291° 35'.7	53'.6
02	166° 22'.6	218° 51'.6	46'.2	190° 54'.3	17'.0	101° 44'.0	48'.9	306° 38'.1	53'.6
03	181° 25'.0	233° 50'.8	45'.5	205° 54'.9	16'.3	116° 46'.4	48'.9	321° 40'.5	53'.6
04	196° 27'.5	248° 50'.0	44'.8	220° 55'.5	15'.5	131° 48'.8	48'.9	336° 43'.0	53'.6
05	211° 30'.0	263° 49'.2	44'.1	235° 56'.1	14'.8	146° 51'.2	48'.9	351° 45'.4	53'.6
06	226° 32'.4	278° 48'.4	43'.4	250° 56'.7	14'.1	161° 53'.6	49'.0	6° 47'.8	53'.6
07	241° 34'.9	293° 47'.6	42'.8	265° 57'.3	13'.4	176° 56'.0	49'.0	21° 50'.2	53'.6
08	256° 37'.4	308° 46'.9	42'.1	280° 57'.9	12'.6	191° 58'.4	49'.0	36° 52'.6	53'.6
09	271° 39'.8	323° 46'.1	41'.4	295° 58'.5	11'.9	207° 00'.9	49'.0	51° 55'.0	53'.7
10	286° 42'.3	338° 45'.3	40'.7	310° 59'.1	11'.2	222° 03'.3	49'.0	66° 57'.4	53'.7
11	301° 44'.8	353° 44'.5	40'.0	325° 59'.7	10'.4	237° 05'.7	49'.1	81° 59'.8	53'.7
12	316° 47'.2	8° 43'.7	19° 39'.3 S	341° 00'.3	11° 09'.7 S	252° 08'.1	20° 49'.1 N	97° 02'.2	12° 53'.7 S
13	331° 49'.7	23° 43'.0	38'.7	356° 00'.9	09'.0	267° 10'.5	49'.1	112° 04'.6	53'.7
14	346° 52'.2	38° 42'.2	38'.0	11° 01'.5	08'.2	282° 12'.9	49'.1	127° 07'.0	53'.7
15	1° 54'.6	53° 41'.4	37'.3	26° 02'.1	07'.5	297° 15'.3	49'.1	142° 09'.5	53'.7
16	16° 57'.1	68° 40'.6	36'.6	41° 02'.7	06'.8	312° 17'.7	49'.2	157° 11'.9	53'.7
17	31° 59'.5	83° 39'.8	35'.9	56° 03'.2	06'.1	327° 20'.1	49'.2	172° 14'.3	53'.7
18	47° 02'.0	98° 39'.1	35'.2	71° 03'.8	05'.3	342° 22'.5	49'.2	187° 16'.7	53'.7
19	62° 04'.5	113° 38'.3	34'.5	86° 04'.4	04'.6	357° 24'.9	49'.2	202° 19'.1	53'.7
20	77° 06'.9	128° 37'.5	33'.8	101° 05'.0	03'.9	12° 27'.3	49'.2	217° 21'.5	53'.7
21	92° 09'.4	143° 36'.7	33'.1	116° 05'.6	03'.1	27° 29'.7	49'.3	232° 23'.9	53'.7
22	107° 11'.9	158° 35'.9	32'.4	131° 06'.2	02'.4	42° 32'.1	49'.3	247° 26'.3	53'.7
23	122° 14'.3	173° 35'.2	31'.7	146° 06'.8	01'.7	57° 34'.5	49'.3	262° 28'.7	53'.7
7 Thursday 00	137° 16'.8	188° 34'.4	19° 31'.0 S	161° 07'.4	11° 00'.9 S	72° 36'.9	20° 49'.3 N	277° 31'.1	12° 53'.7 S
01	152° 19'.3	203° 33'.6	30'.3	176° 08'.0	00'.2	87° 39'.3	49'.3	292° 33'.6	53'.8
02	167° 21'.7	218° 32'.8	29'.6	191° 08'.6	10° 59'.5 S	102° 41'.7	49'.4	307° 36'.0	53'.8
03	182° 24'.2	233° 32'.1	28'.9	206° 09'.2	58'.7	117° 44'.1	49'.4	322° 38'.4	53'.8
04	197° 26'.7	248° 31'.3	28'.2	221° 09'.8	58'.0	132° 46'.5	49'.4	337° 40'.8	53'.8
05	212° 29'.1	263° 30'.5	27'.5	236° 10'.4	57'.3	147° 48'.9	49'.4	352° 43'.2	53'.8
06	227° 31'.6	278° 29'.7	26'.8	251° 11'.0	56'.5	162° 51'.3	49'.4	7° 45'.6	53'.8
07	242° 34'.0	293° 29'.0	26'.1	266° 11'.6	55'.8	177° 53'.7	49'.5	22° 48'.0	53'.8
08	257° 36'.5	308° 28'.2	25'.4	281° 12'.2	55'.1	192° 56'.1	49'.5	37° 50'.4	53'.8
09	272° 39'.0	323° 27'.4	24'.7	296° 12'.8	54'.3	207° 58'.4	49'.5	52° 52'.9	53'.8
10	287° 41'.4	338° 26'.7	24'.0	311° 13'.4	53'.6	223° 00'.8	49'.5	67° 55'.3	53'.8
11	302° 43'.9	353° 25'.9	23'.3	326° 14'.0	52'.9	238° 03'.2	49'.5	82° 57'.7	53'.8
12	317° 46'.4	8° 25'.1	19° 22'.6 S	341° 14'.6	10° 52'.1 S	253° 05'.6	20° 49'.6 N	98° 00'.1	12° 53'.8 S
13	332° 48'.8	23° 24'.3	21'.9	356° 15'.2	51'.4	268° 08'.0	49'.6	113° 02'.5	53'.8
14	347° 51'.3	38° 23'.6	21'.2	11° 15'.8	50'.7	283° 10'.4	49'.6	128° 04'.9	53'.8
15	2° 53'.8	53° 22'.8	20'.5	26° 16'.4	49'.9	298° 12'.8	49'.6	143° 07'.3	53'.8
16	17° 56'.2	68° 22'.0	19'.8	41° 17'.0	49'.2	313° 15'.2	49'.6	158° 09'.7	53'.8
17	32° 58'.7	83° 21'.3	19'.0	56° 17'.6	48'.5	328° 17'.6	49'.7	173° 12'.2	53'.8
18	48° 01'.2	98° 20'.5	18'.3	71° 18'.2	47'.7	343° 20'.0	49'.7	188° 14'.6	53'.8
19	63° 03'.6	113° 19'.7	17'.6	86° 18'.8	47'.0	358° 22'.4	49'.7	203° 17'.0	53'.9
20	78° 06'.1	128° 19'.0	16'.9	101° 19'.4	46'.3	13° 24'.8	49'.7	218° 19'.4	53'.9
21	93° 08'.5	143° 18'.2	16'.2	116° 20'.0	45'.5	28° 27'.2	49'.7	233° 21'.8	53'.9
22	108° 11'.0	158° 17'.4	15'.5	131° 20'.6	44'.8	43° 29'.6	49'.8	248° 24'.2	53'.9
23	123° 13'.5	173° 16'.7	14'.7	146° 21'.2	44'.0	58° 31'.9	49'.8	263° 26'.6	53'.9
8 Friday 00	138° 15'.9	188° 15'.9	19° 14'.0 S	161° 21'.8	10° 43'.3 S	73° 34'.3	20° 49'.8 N	278° 29'.1	12° 53'.9 S
01	153° 18'.4	203° 15'.2	13'.3	176° 22'.4	42'.6	88° 36'.7	49'.8	293° 31'.5	53'.9
02	168° 20'.9	218° 14'.4	12'.6	191° 23'.0	41'.8	103° 39'.1	49'.9	308° 33'.9	53'.9
03	183° 23'.3	233° 13'.6	11'.8	206° 23'.6	41'.1	118° 41'.5	49'.9	323° 36'.3	53'.9
04	198° 25'.8	248° 12'.9	11'.1	221° 24'.2	40'.4	133° 43'.9	49'.9	338° 38'.7	53'.9
05	213° 28'.3	263° 12'.1	10'.4	236° 24'.8	39'.6	148° 46'.3	49'.9	353° 41'.1	53'.9
06	228° 30'.7	278° 11'.3	09'.7	251° 25'.4	38'.9	163° 48'.7	49'.9	8° 43'.6	53'.9
07	243° 33'.2	293° 10'.6	08'.9	266° 26'.0	38'.1	178° 51'.1	50'.0	23° 46'.0	53'.9
08	258° 35'.7	308° 09'.8	08'.2	281° 26'.6	37'.4	193° 53'.4	50'.0	38° 48'.4	53'.9
09	273° 38'.1	323° 09'.1	07'.5	296° 27'.2	36'.7	208° 55'.8	50'.0	53° 50'.8	53'.9
10	288° 40'.6	338° 08'.3	06'.8	311° 27'.8	35'.9	223° 58'.2	50'.0	68° 53'.2	53'.9
11	303° 43'.0	353° 07'.5	06'.0	326° 28'.4	35'.2	239° 00'.6	50'.1	83° 55'.6	53'.9
12	318° 45'.5	8° 06'.8	19° 05'.3 S	341° 29'.0	10° 34'.5 S	254° 03'.0	20° 50'.1 N	98° 58'.1	12° 53'.9 S
13	333° 48'.0	23° 06'.0	04'.6	356° 29'.6	33'.7	269° 05'.4	50'.1	114° 00'.5	53'.9
14	348° 50'.4	38° 05'.3	03'.8	11° 30'.2	33'.0	284° 07'.8	50'.1	129° 02'.9	53'.9
15	3° 52'.9	53° 04'.5	03'.1	26° 30'.8	32'.2	299° 10'.1	50'.1	144° 05'.3	53'.9
16	18° 55'.4	68° 03'.8	02'.4	41° 31'.4	31'.5	314° 12'.5	50'.2	159° 07'.7	53'.9
17	33° 57'.8	83° 03'.0	01'.6	56° 32'.0	30'.8	329° 14'.9	50'.2	174° 10'.1	54'.0
18	49° 00'.3	98° 02'.2	00'.9	71° 32'.6	30'.0	344° 17'.3	50'.2	189° 12'.6	54'.0
19	64° 02'.8	113° 01'.5	00'.1	86° 33'.2	29'.3	359° 19'.7	50'.2	204° 15'.0	54'.0
20	79° 05'.2	128° 00'.7	18° 59'.4 S	101° 33'.8	28'.5	14° 22'.1	50'.3	219° 17'.4	54'.0
21	94° 07'.7	143° 00'.0	58'.7	116° 34'.4	27'.8	29° 24'.4	50'.3	234° 19'.8	54'.0
22	109° 10'.1	157° 59'.2	57'.9	131° 35'.0	27'.1	44° 26'.8	50'.3	249° 22'.2	54'.0
23	124° 12'.6	172° 58'.5	57'.2	146° 35'.6	26'.3	59° 29'.2	50'.3	264° 24'.7	54'.0
	M.P. 14:48	v -0'.8	d 0'.7	v 0'.6	d 0'.7	v 2'.4	d 0'.0	v 2'.4	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.5	40° 15'.4 S
Achernar	335° 27'.2	57° 10'.5 S
Acrux	173° 09'.1	63° 10'.2 S
Adhara	255° 12'.4	28° 59'.7 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.6	55° 53'.0 N
Alkaid	152° 58'.9	49° 14'.5 N
Alnair	27° 44'.5	46° 53'.8 S
Alnilam	275° 46'.4	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.2	26° 40'.1 N
Alpheratz	357° 44'.0	29° 09'.9 N
Altair	62° 08'.8	8° 54'.2 N
Ankaa	353° 16'.2	42° 14'.3 S
Antares	112° 26'.6	26° 27'.5 S
Arcturus	145° 55'.9	19° 06'.6 N
Atria	107° 28'.9	69° 02'.7 S
Avior	234° 17'.4	59° 33'.4 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.3 N
Canopus	263° 55'.8	52° 42'.5 S
Capella	280° 34'.5	46° 00'.7 N
Deneb	49° 32'.1	45° 19'.7 N
Denebola	182° 33'.6	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.4	61° 40'.5 N
Elnath	278° 12'.7	28° 37'.0 N
Eltanin	90° 46'.6	51° 29'.1 N
Enif	33° 47'.6	9° 56'.2 N
Fomalhaut	15° 24'.6	29° 33'.2 S
Gacrux	172° 00'.7	57° 11'.1 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.0	60° 25'.9 S
Hamal	328° 01'.1	23° 31'.5 N
Kaus Aust.	83° 44'.4	34° 22'.5 S
Kochab	137° 20'.0	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.3	4° 08'.4 N
Menkent	148° 07'.7	36° 26'.0 S
Miaplacidus	221° 38'.7	69° 46'.4 S
Mirfak	308° 40'.6	49° 54'.6 N
Nunki	75° 58'.9	26° 16'.7 S
Peacock	53° 20'.2	56° 41'.4 S
Polaris	317° 54'.4	89° 19'.5 N
Pollux	243° 27'.6	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.2 N
Rasalhague	96° 06'.9	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.1	8° 11'.5 S
Rigil Kent	139° 51'.9	60° 53'.1 S
Sabik	102° 13'.0	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.8 N
Shaula	96° 22'.4	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.4 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.4 S
Vega	80° 39'.4	38° 47'.7 N
Zuben'ubi	137° 05'.6	16° 05'.7 S

	SHA	Mer.Pass.
Venus	51° 17'.6	11:26
Mars	23° 50'.6	13:15
Jupiter	295° 20'.1	19:06
Saturn	140° 14'.3	05:29

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
6 Wednesday 00	176° 29'.5	15° 37'.8 S	237° 50'.7	4'.8	20° 42'.1 S	0'.1	59'.8
01	191° 29'.4	37'.1	252° 14'.5	4'.8	42'.0	0'.1	
02	206° 29'.4	36'.3	266° 38'.3	4'.8	41'.9	0'.3	
03	221° 29'.3	35'.5	281° 02'.1	4'.8	41'.6	0'.5	
04	236° 29'.3	34'.7	295° 25'.9	4'.8	41'.1	0'.5	59'.9
05	251° 29'.3	34'.0	309° 49'.7	4'.8	40'.6	0'.8	
06	266° 29'.2	33'.2	324° 13'.5	4'.8	39'.8	0'.8	
07	281° 29'.2	32'.4	338° 37'.3	4'.7	39'.0	1'.1	
08	296° 29'.1	31'.6	353° 01'.0	4'.8	37'.9	1'.1	
09	311° 29'.1	30'.9	7° 24'.8	4'.8	36'.8	1'.3	
10	326° 29'.1	30'.1	21° 48'.6	4'.7	35'.5	1'.5	
11	341° 29'.0	29'.3	36° 12'.3	4'.8	34'.0	1'.6	
12	356° 29'.0	15° 28'.5 S	50° 36'.1	4'.7	20° 32'.4 S	1'.7	59'.9
13	11° 28'.9	27'.8	64° 59'.8	4'.8	30'.7	1'.9	
14	26° 28'.9	27'.0	79° 23'.6	4'.8	28'.8	2'.0	
15	41° 28'.9	26'.2	93° 47'.4	4'.7	26'.8	2'.2	
16	56° 28'.8	25'.4	108° 11'.1	4'.8	24'.6	2'.3	60'.0
17	71° 28'.8	24'.7	122° 34'.9	4'.8	22'.3	2'.4	
18	86° 28'.7	23'.9	136° 58'.7	4'.8	19'.9	2'.6	
19	101° 28'.7	23'.1	151° 22'.5	4'.8	17'.3	2'.8	
20	116° 28'.7	22'.3	165° 46'.3	4'.8	14'.5	2'.8	
21	131° 28'.6	21'.5	180° 10'.1	4'.9	11'.7	3'.0	
22	146° 28'.6	20'.8	194° 34'.0	4'.8	08'.7	3'.2	
23	161° 28'.6	20'.0	208° 57'.8	4'.9	05'.5	3'.3	
7 Thursday 00	176° 28'.5	15° 19'.2 S	223° 21'.7	4'.9	20° 02'.2 S	3'.4	60'.0
01	191° 28'.5	18'.4	237° 45'.6	4'.9	19° 58'.8 S	3'.6	
02	206° 28'.5	17'.6	252° 09'.5	4'.9	55'.2	3'.7	
03	221° 28'.4	16'.9	266° 33'.4	5'.0	51'.5	3'.9	
04	236° 28'.4	16'.1	280° 57'.4	5'.0	47'.6	4'.0	
05	251° 28'.4	15'.3	295° 21'.4	5'.0	43'.6	4'.1	
06	266° 28'.3	14'.5	309° 45'.4	5'.0	39'.5	4'.3	
07	281° 28'.3	13'.7	324° 09'.4	5'.1	35'.2	4'.4	
08	296° 28'.3	12'.9	338° 33'.5	5'.1	30'.8	4'.5	
09	311° 28'.2	12'.2	352° 57'.6	5'.1	26'.3	4'.7	
10	326° 28'.2	11'.4	7° 21'.7	5'.2	21'.6	4'.8	
11	341° 28'.2	10'.6	21° 45'.9	5'.2	16'.8	4'.9	
12	356° 28'.1	15° 09'.8 S	36° 10'.1	5'.2	19° 11'.9 S	5'.1	60'.0
13	11° 28'.1	09'.0	50° 34'.3	5'.3	06'.8	5'.2	
14	26° 28'.1	08'.2	64° 58'.6	5'.3	01'.6	5'.3	
15	41° 28'.1	07'.4	79° 22'.9	5'.4	18° 56'.3 S	5'.5	
16	56° 28'.0	06'.7	93° 47'.3	5'.3	50'.8	5'.6	
17	71° 28'.0	05'.9	108° 11'.6	5'.5	45'.2	5'.7	
18	86° 28'.0	05'.1	122° 36'.1	5'.5	39'.5	5'.8	
19	101° 27'.9	04'.3	137° 00'.6	5'.5	33'.7	6'.0	
20	116° 27'.9	03'.5	151° 25'.1	5'.5	27'.7	6'.1	
21	131° 27'.9	02'.7	165° 49'.6	5'.6	21'.6	6'.2	
22	146° 27'.9	01'.9	180° 14'.2	5'.7	15'.4	6'.4	
23	161° 27'.8	01'.1	194° 38'.9	5'.7	09'.0	6'.4	
8 Friday 00	176° 27'.8	15° 00'.3 S	209° 03'.6	5'.8	18° 02'.6 S	6'.6	60'.0
01	191° 27'.8	14° 59'.5 S	223° 28'.4	5'.8	17° 56'.0 S	6'.7	
02	206° 27'.7	58'.8	237° 53'.2	5'.8	49'.3	6'.8	
03	221° 27'.7	58'.0	252° 18'.0	5'.9	42'.5	7'.0	
04	236° 27'.7	57'.2	266° 42'.9	6'.0	35'.5	7'.0	
05	251° 27'.7	56'.4	281° 07'.9	6'.0	28'.5	7'.2	
06	266° 27'.6	55'.6	295° 32'.9	6'.1	21'.3	7'.3	
07	281° 27'.6	54'.8	309° 58'.0	6'.1	14'.0	7'.4	
08	296° 27'.6	54'.0	324° 23'.1	6'.2	06'.6	7'.5	
09	311° 27'.6	53'.2	338° 48'.3	6'.2	16° 59'.1 S	7'.6	59'.9
10	326° 27'.6	52'.4	353° 13'.5	6'.3	51'.5	7'.8	
11	341° 27'.5	51'.6	7° 38'.8	6'.4	43'.7	7'.8	
12	356° 27'.5	14° 50'.8 S	22° 04'.2	6'.4	16° 35'.9 S	8'.0	59'.9
13	11° 27'.5	50'.0	36° 29'.6	6'.5	27'.9	8'.0	
14	26° 27'.5	49'.2	50° 55'.1	6'.5	19'.9	8'.2	
15	41° 27'.4	48'.4	65° 20'.6	6'.6	11'.7	8'.3	
16	56° 27'.4	47'.6	79° 46'.2	6'.7	03'.4	8'.3	
17	71° 27'.4	46'.8	94° 11'.9	6'.7	15° 55'.1 S	8'.5	
18	86° 27'.4	46'.0	108° 37'.6	6'.8	46'.6	8'.6	
19	101° 27'.4	45'.2	123° 03'.4	6'.8	38'.0	8'.6	
20	116° 27'.3	44'.4	137° 29'.2	6'.9	29'.4	8'.8	59'.8
21	131° 27'.3	43'.6	151° 55'.1	7'.0	20'.6	8'.8	
22	146° 27'.3	42'.8	166° 21'.1	7'.0	11'.8	9'.0	
23	161° 27'.3	42'.0	180° 47'.1	7'.1	02'.8	9'.0	
	SD 16'.2	d 0'.8	SD 16'.3		16'.4	16'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8
N 72°	06:46	08:11	09:42	-	-	09:11
N 70°	06:41	07:56	09:13	-	08:41	08:17
68°	06:37	07:44	08:51	07:06	07:35	07:44
66°	06:33	07:35	08:34	06:19	06:58	07:19
64°	06:29	07:27	08:20	05:48	06:32	07:00
62°	06:26	07:19	08:09	05:25	06:12	06:44
60°	06:23	07:13	07:59	05:06	05:55	06:31
N 58°	06:21	07:08	07:50	04:51	05:41	06:20
56°	06:18	07:03	07:43	04:37	05:29	06:10
54°	06:16	06:58	07:36	04:26	05:19	06:01
52°	06:14	06:54	07:30	04:16	05:09	05:53
50°	06:12	06:50	07:24	04:07	05:01	05:46
45°	06:07	06:41	07:12	03:48	04:43	05:31
N 40°	06:02	06:34	07:02	03:32	04:28	05:18
35°	05:58	06:28	06:54	03:19	04:16	05:07
30°	05:53	06:21	06:46	03:07	04:05	04:58
20°	05:44	06:10	06:33	02:48	03:46	04:42
N 10°	05:35	06:00	06:22	02:31	03:30	04:28
0°	05:24	05:49	06:11	02:15	03:15	04:14
S 10°	05:12	05:38	06:00	01:59	03:00	04:01
20°	04:57	05:25	05:48	01:42	02:44	03:47
30°	04:38	05:08	05:34	01:22	02:25	03:30
35°	04:26	04:59	05:26	01:11	02:14	03:21
40°	04:11	04:47	05:17	00:58	02:02	03:10
45°	03:53	04:33	05:06	00:43	01:47	02:57
S 50°	03:29	04:16	04:53	00:24	01:29	02:42
52°	03:16	04:07	04:46	00:15	01:20	02:34
54°	03:02	03:58	04:40	00:05	01:11	02:26
56°	02:45	03:47	04:32	-	01:00	02:17
58°	02:24	03:34	04:23	-	00:48	02:06
S 60°	01:55	03:20	04:13	-	00:33	01:54
S 62°	01:07	03:02	04:02	-	00:16	01:40

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 6	Moonset 7	Moonset 8
N 72°	14:48	16:19	17:44	-	-	12:00
N 70°	15:17	16:34	17:49	-	10:26	12:53
68°	15:38	16:45	17:53	09:54	11:32	13:25
66°	15:55	16:55	17:57	10:41	12:07	13:49
64°	16:09	17:03	18:00	11:12	12:33	14:07
62°	16:21	17:10	18:03	11:35	12:53	14:22
60°	16:30	17:16	18:06	11:54	13:09	14:35
N 58°	16:39	17:22	18:08	12:09	13:23	14:46
56°	16:47	17:27	18:11	12:22	13:34	14:55
54°	16:53	17:31	18:13	12:34	13:45	15:03
52°	16:59	17:35	18:15	12:44	13:54	15:11
50°	17:05	17:39	18:17	12:53	14:02	15:17
45°	17:17	17:47	18:22	13:12	14:19	15:32
N 40°	17:26	17:55	18:27	13:27	14:33	15:43
35°	17:35	18:01	18:31	13:40	14:45	15:53
30°	17:42	18:07	18:36	13:51	14:56	16:02
20°	17:55	18:18	18:44	14:11	15:14	16:17
N 10°	18:07	18:28	18:54	14:28	15:29	16:30
0°	18:18	18:39	19:04	14:43	15:44	16:42
S 10°	18:29	18:50	19:16	14:59	15:58	16:54
20°	18:40	19:03	19:31	15:16	16:13	17:07
30°	18:54	19:19	19:49	15:35	16:31	17:21
35°	19:02	19:29	20:01	15:46	16:41	17:29
40°	19:11	19:40	20:16	15:59	16:52	17:39
45°	19:22	19:54	20:34	16:14	17:06	17:50
S 50°	19:35	20:11	20:58	16:33	17:22	18:03
52°	19:41	20:19	21:10	16:41	17:30	18:09
54°	19:47	20:29	21:24	16:51	17:38	18:16
56°	19:55	20:39	21:40	17:02	17:48	18:24
58°	20:03	20:52	22:01	17:14	17:59	18:32
S 60°	20:13	21:06	22:28	17:29	18:11	18:42
S 62°	20:24	21:24	23:12	17:46	18:26	18:53

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
6	14 02	14 04	12:14	08:29	20:59	26d 19%
7	14 06	14 07	12:14	09:29	21:59	27d 11%
8	14 09	14 10	12:14	10:28	22:57	28d 5%

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2013 February 9, 10, 11 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.4		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
9 Saturday 00	139° 15'.1	187° 57'.7	18° 56'.4 S	161° 36'.2	10° 25'.6 S	74° 31'.6	20° 50'.3 N	279° 27'.1	12° 54'.0 S
01	154° 17'.5	202° 57'.0	55'.7	176° 36'.8	24'.8	89° 34'.0	50'.4	294° 29'.5	54'.0
02	169° 20'.0	217° 56'.2	54'.9	191° 37'.4	24'.1	104° 36'.4	50'.4	309° 31'.9	54'.0
03	184° 22'.5	232° 55'.5	54'.2	206° 38'.0	23'.4	119° 38'.7	50'.4	324° 34'.3	54'.0
04	199° 24'.9	247° 54'.7	53'.4	221° 38'.6	22'.6	134° 41'.1	50'.4	339° 36'.8	54'.0
05	214° 27'.4	262° 54'.0	52'.7	236° 39'.2	21'.9	149° 43'.5	50'.5	354° 39'.2	54'.0
06	229° 29'.9	277° 53'.2	51'.9	251° 39'.8	21'.1	164° 45'.9	50'.5	9° 41'.6	54'.0
07	244° 32'.3	292° 52'.5	51'.2	266° 40'.4	20'.4	179° 48'.3	50'.5	24° 44'.0	54'.0
08	259° 34'.8	307° 51'.7	50'.4	281° 41'.0	19'.7	194° 50'.6	50'.5	39° 46'.4	54'.0
09	274° 37'.3	322° 51'.0	49'.7	296° 41'.6	18'.9	209° 53'.0	50'.6	54° 48'.9	54'.0
10	289° 39'.7	337° 50'.2	48'.9	311° 42'.3	18'.2	224° 55'.4	50'.6	69° 51'.3	54'.0
11	304° 42'.2	352° 49'.5	48'.2	326° 42'.9	17'.4	239° 57'.8	50'.6	84° 53'.7	54'.0
12	319° 44'.6	7° 48'.7	18° 47'.4 S	341° 43'.5	10° 16'.7 S	255° 00'.1	20° 50'.6 N	99° 56'.1	12° 54'.0 S
13	334° 47'.1	22° 48'.0	46'.7	356° 44'.1	15'.9	270° 02'.5	50'.7	114° 58'.6	54'.0
14	349° 49'.6	37° 47'.2	45'.9	11° 44'.7	15'.2	285° 04'.9	50'.7	130° 01'.0	54'.0
15	4° 52'.0	52° 46'.5	45'.2	26° 45'.3	14'.5	300° 07'.3	50'.7	145° 03'.4	54'.0
16	19° 54'.5	67° 45'.8	44'.4	41° 45'.9	13'.7	315° 09'.6	50'.7	160° 05'.8	54'.0
17	34° 57'.0	82° 45'.0	43'.6	56° 46'.5	13'.0	330° 12'.0	50'.7	175° 08'.2	54'.0
18	49° 59'.4	97° 44'.3	42'.9	71° 47'.1	12'.2	345° 14'.4	50'.8	190° 10'.7	54'.0
19	65° 01'.9	112° 43'.5	42'.1	86° 47'.7	11'.5	0° 16'.8	50'.8	205° 13'.1	54'.0
20	80° 04'.4	127° 42'.8	41'.4	101° 48'.3	10'.7	15° 19'.1	50'.8	220° 15'.5	54'.0
21	95° 06'.8	142° 42'.0	40'.6	116° 48'.9	10'.0	30° 21'.5	50'.8	235° 17'.9	54'.0
22	110° 09'.3	157° 41'.3	39'.8	131° 49'.5	09'.2	45° 23'.9	50'.9	250° 20'.4	54'.0
23	125° 11'.8	172° 40'.6	39'.1	146° 50'.1	08'.5	60° 26'.3	50'.9	265° 22'.8	54'.0
10 Sunday 00	140° 14'.2	187° 39'.8	18° 38'.3 S	161° 50'.7	10° 07'.8 S	75° 28'.6	20° 50'.9 N	280° 25'.2	12° 54'.0 S
01	155° 16'.7	202° 39'.1	37'.5	176° 51'.4	07'.0	90° 31'.0	50'.9	295° 27'.6	54'.0
02	170° 19'.1	217° 38'.3	36'.8	191° 52'.0	06'.3	105° 33'.4	51'.0	310° 30'.1	54'.0
03	185° 21'.6	232° 37'.6	36'.0	206° 52'.6	05'.5	120° 35'.7	51'.0	325° 32'.5	54'.0
04	200° 24'.1	247° 36'.9	35'.2	221° 53'.2	04'.8	135° 38'.1	51'.0	340° 34'.9	54'.0
05	215° 26'.5	262° 36'.1	34'.4	236° 53'.8	04'.0	150° 40'.5	51'.0	355° 37'.3	54'.1
06	230° 29'.0	277° 35'.4	33'.7	251° 54'.4	03'.3	165° 42'.9	51'.1	10° 39'.7	54'.1
07	245° 31'.5	292° 34'.6	32'.9	266° 55'.0	02'.5	180° 45'.2	51'.1	25° 42'.2	54'.1
08	260° 33'.9	307° 33'.9	32'.1	281° 55'.6	01'.8	195° 47'.6	51'.1	40° 44'.6	54'.1
09	275° 36'.4	322° 33'.2	31'.4	296° 56'.2	01'.1	210° 50'.0	51'.1	55° 47'.0	54'.1
10	290° 38'.9	337° 32'.4	30'.6	311° 56'.8	00'.3	225° 52'.3	51'.2	70° 49'.4	54'.1
11	305° 41'.3	352° 31'.7	29'.8	326° 57'.4	9° 59'.6 S	240° 54'.7	51'.2	85° 51'.9	54'.1
12	320° 43'.8	7° 31'.0	18° 29'.0 S	341° 58'.0	9° 58'.8 S	255° 57'.1	20° 51'.2 N	100° 54'.3	12° 54'.1 S
13	335° 46'.2	22° 30'.2	28'.2	356° 58'.7	58'.1	270° 59'.4	51'.2	115° 56'.7	54'.1
14	350° 48'.7	37° 29'.5	27'.5	11° 59'.3	57'.3	286° 01'.8	51'.3	130° 59'.2	54'.1
15	5° 51'.2	52° 28'.8	26'.7	26° 59'.9	56'.6	301° 04'.2	51'.3	146° 01'.6	54'.1
16	20° 53'.6	67° 28'.0	25'.9	42° 00'.5	55'.8	316° 06'.5	51'.3	161° 04'.0	54'.1
17	35° 56'.1	82° 27'.3	25'.1	57° 01'.1	55'.1	331° 08'.9	51'.3	176° 06'.4	54'.1
18	50° 58'.6	97° 26'.6	24'.3	72° 01'.7	54'.3	346° 11'.3	51'.4	191° 08'.9	54'.1
19	66° 01'.0	112° 25'.8	23'.6	87° 02'.3	53'.6	1° 13'.6	51'.4	206° 11'.3	54'.1
20	81° 03'.5	127° 25'.1	22'.8	102° 02'.9	52'.8	16° 16'.0	51'.4	221° 13'.7	54'.1
21	96° 06'.0	142° 24'.4	22'.0	117° 03'.5	52'.1	31° 18'.4	51'.4	236° 16'.1	54'.1
22	111° 08'.4	157° 23'.7	21'.2	132° 04'.2	51'.3	46° 20'.7	51'.5	251° 18'.6	54'.1
23	126° 10'.9	172° 22'.9	20'.4	147° 04'.8	50'.6	61° 23'.1	51'.5	266° 21'.0	54'.1
11 Monday 00	141° 13'.4	187° 22'.2	18° 19'.6 S	162° 05'.4	9° 49'.9 S	76° 25'.5	20° 51'.5 N	281° 23'.4	12° 54'.1 S
01	156° 15'.8	202° 21'.5	18'.8	177° 06'.0	49'.1	91° 27'.8	51'.5	296° 25'.9	54'.1
02	171° 18'.3	217° 20'.7	18'.0	192° 06'.6	48'.4	106° 30'.2	51'.6	311° 28'.3	54'.1
03	186° 20'.7	232° 20'.0	17'.3	207° 07'.2	47'.6	121° 32'.6	51'.6	326° 30'.7	54'.1
04	201° 23'.2	247° 19'.3	16'.5	222° 07'.8	46'.9	136° 34'.9	51'.6	341° 33'.1	54'.1
05	216° 25'.7	262° 18'.6	15'.7	237° 08'.4	46'.1	151° 37'.3	51'.6	356° 35'.6	54'.1
06	231° 28'.1	277° 17'.8	14'.9	252° 09'.0	45'.4	166° 39'.6	51'.7	11° 38'.0	54'.1
07	246° 30'.6	292° 17'.1	14'.1	267° 09'.7	44'.6	181° 42'.0	51'.7	26° 40'.4	54'.1
08	261° 33'.1	307° 16'.4	13'.3	282° 10'.3	43'.9	196° 44'.4	51'.7	41° 42'.9	54'.1
09	276° 35'.5	322° 15'.7	12'.5	297° 10'.9	43'.1	211° 46'.7	51'.7	56° 45'.3	54'.1
10	291° 38'.0	337° 14'.9	11'.7	312° 11'.5	42'.4	226° 49'.1	51'.8	71° 47'.7	54'.1
11	306° 40'.5	352° 14'.2	10'.9	327° 12'.1	41'.6	241° 51'.4	51'.8	86° 50'.1	54'.1
12	321° 42'.9	7° 13'.5	18° 10'.1 S	342° 12'.7	9° 40'.9 S	256° 53'.8	20° 51'.8 N	101° 52'.6	12° 54'.1 S
13	336° 45'.4	22° 12'.8	09'.3	357° 13'.3	40'.1	271° 56'.2	51'.9	116° 55'.0	54'.1
14	351° 47'.9	37° 12'.1	08'.5	12° 13'.9	39'.4	286° 58'.5	51'.9	131° 57'.4	54'.1
15	6° 50'.3	52° 11'.3	07'.7	27° 14'.6	38'.6	302° 00'.9	51'.9	146° 59'.9	54'.1
16	21° 52'.8	67° 10'.6	06'.9	42° 15'.2	37'.9	317° 03'.2	51'.9	162° 02'.3	54'.1
17	36° 55'.2	82° 09'.9	06'.1	57° 15'.8	37'.1	332° 05'.6	52'.0	177° 04'.7	54'.1
18	51° 57'.7	97° 09'.2	05'.3	72° 16'.4	36'.4	347° 08'.0	52'.0	192° 07'.2	54'.1
19	67° 00'.2	112° 08'.5	04'.5	87° 17'.0	35'.6	2° 10'.3	52'.0	207° 09'.6	54'.1
20	82° 02'.6	127° 07'.7	03'.7	102° 17'.6	34'.9	17° 12'.7	52'.0	222° 12'.0	54'.1
21	97° 05'.1	142° 07'.0	02'.9	117° 18'.2	34'.1	32° 15'.0	52'.1	237° 14'.5	54'.1
22	112° 07'.6	157° 06'.3	02'.0	132° 18'.9	33'.4	47° 17'.4	52'.1	252° 16'.9	54'.1
23	127° 10'.0	172° 05'.6	01'.2	147° 19'.5	32'.6	62° 19'.7	52'.1	267° 19'.3	54'.1
	M.P. 14:37	v -0'.7	d 0'.8	v 0'.6	d 0'.7	v 2'.4	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.5	40° 15'.4 S
Achernar	335° 27'.2	57° 10'.5 S
Acrux	173° 09'.0	63° 10'.2 S
Adhara	255° 12'.4	28° 59'.7 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.6	55° 53'.0 N
Alkaid	152° 58'.9	49° 14'.5 N
Alnair	27° 44'.5	46° 53'.8 S
Alnilam	275° 46'.4	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.2	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.9 N
Altair	62° 08'.7	8° 54'.2 N
Ankaa	353° 16'.2	42° 14'.3 S
Antares	112° 26'.6	26° 27'.5 S
Arcturus	145° 55'.8	19° 06'.6 N
Atria	107° 28'.9	69° 02'.7 S
Avior	234° 17'.5	59° 33'.4 S
Bellatrix	278° 32'.0	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.3 N
Canopus	263° 55'.8	52° 42'.5 S
Capella	280° 34'.5	46° 00'.7 N
Deneb	49° 32'.1	45° 19'.7 N
Denebola	182° 33'.6	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.4	61° 40'.5 N
Elnath	278° 12'.7	28° 37'.0 N
Eltanin	90° 46'.6	51° 29'.1 N
Enif	33° 47'.6	9° 56'.2 N
Fomalhaut	15° 24'.6	29° 33'.2 S
Gacrux	172° 00'.7	57° 11'.1 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 47'.9	60° 26'.0 S
Hamal	328° 01'.1	23° 31'.5 N
Kaus Aust.	83° 44'.4	34° 22'.5 S
Kochab	137° 19'.9	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.3	4° 08'.3 N
Menkent	148° 07'.7	36° 26'.0 S
Miaplacidus	221° 38'.7	69° 46'.5 S
Mirfak	308° 40'.6	49° 54'.6 N
Nunki	75° 58'.9	26° 16'.7 S
Peacock	53° 20'.2	56° 41'.4 S
Polaris	317° 55'.8	89° 19'.5 N
Pollux	243° 27'.6	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.2 N
Rasalhague	96° 06'.8	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.1	8° 11'.5 S
Rigil Kent	139° 51'.8	60° 53'.1 S
Sabik	102° 12'.9	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.8 N
Shaula	96° 22'.4	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.4 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.4 S
Vega	80° 39'.4	38° 47'.7 N
Zuben'ubi	137° 05'.6	16° 05'.8 S

	SHA	Mer.Pass.
Venus	47° 25'.6	11:30
Mars	21° 36'.5	13:12
Jupiter	295° 14'.4	18:55
Saturn	140° 11'.0	05:17

SUN				MOON				
GHA	Dec	GHA	v	Dec	d	HP
176° 27'.3	14° 41'.2 S	195° 13'.2	7'.2	14° 53'.8 S	9'.2	59'.8
191° 27'.2	40'.4	209° 39'.4	7'.2	44'.6	9'.2	
206° 27'.2	39'.6	224° 05'.6	7'.3	35'.4	9'.3	
221° 27'.2	38'.8	238° 31'.9	7'.4	26'.1	9'.4	
236° 27'.2	38'.0	252° 58'.3	7'.4	16'.7	9'.5	59'.7
251° 27'.2	37'.2	267° 24'.7	7'.5	07'.2	9'.6	
266° 27'.2	36'.4	281° 51'.2	7'.6	13° 57'.6 S	9'.6	
281° 27'.1	35'.6	296° 17'.8	7'.6	48'.0	9'.8	
296° 27'.1	34'.8	310° 44'.4	7'.7	38'.2	9'.8	
311° 27'.1	34'.0	325° 11'.1	7'.8	28'.4	9'.9	
326° 27'.1	33'.2	339° 37'.9	7'.8	18'.5	10'.0	59'.6
341° 27'.1	32'.4	354° 04'.7	7'.9	08'.5	10'.0	
356° 27'.1	14° 31'.6 S	8° 31'.6	8'.0	12° 58'.5 S	10'.1	59'.6
11° 27'.1	30'.7	22° 58'.6	8'.0	48'.4	10'.2	
26° 27'.0	29'.9	37° 25'.6	8'.1	38'.2	10'.3	
41° 27'.0	29'.1	51° 52'.7	8'.2	27'.9	10'.3	
56° 27'.0	28'.3	66° 19'.9	8'.2	17'.6	10'.4	59'.5
71° 27'.0	27'.5	80° 47'.1	8'.3	07'.2	10'.5	
86° 27'.0	26'.7	95° 14'.4	8'.4	11° 56'.7 S	10'.6	
101° 27'.0	25'.9	109° 41'.8	8'.4	46'.1	10'.6	
116° 27'.0	25'.1	124° 09'.2	8'.5	35'.5	10'.6	
131° 27'.0	24'.3	138° 36'.7	8'.6	24'.9	10'.7	59'.4
146° 26'.9	23'.5	153° 04'.3	8'.7	14'.2	10'.8	
161° 26'.9	22'.6	167° 32'.0	8'.7	03'.4	10'.9	
176° 26'.9	14° 21'.8 S	181° 59'.7	8'.7	10° 52'.5 S	10'.9	59'.4
191° 26'.9	21'.0	196° 27'.4	8'.9	41'.6	10'.9	
206° 26'.9	20'.2	210° 55'.3	8'.9	30'.7	11'.1	59'.3
221° 26'.9	19'.4	225° 23'.2	9'.0	19'.6	11'.0	
236° 26'.9	18'.6	239° 51'.2	9'.0	08'.6	11'.1	
251° 26'.9	17'.8	254° 19'.2	9'.1	9° 57'.5 S	11'.2	
266° 26'.9	17'.0	268° 47'.3	9'.2	46'.3	11'.2	59'.2
281° 26'.9	16'.1	283° 15'.5	9'.2	35'.1	11'.3	
296° 26'.8	15'.3	297° 43'.7	9'.3	23'.8	11'.3	
311° 26'.8	14'.5	312° 12'.0	9'.3	12'.5	11'.3	
326° 26'.8	13'.7	326° 40'.3	9'.5	01'.2	11'.4	
341° 26'.8	12'.9	341° 08'.8	9'.5	8° 49'.8 S	11'.4	59'.1
356° 26'.8	14° 12'.1 S	355° 37'.3	9'.5	8° 38'.4 S	11'.5	59'.1
11° 26'.8	11'.2	10° 05'.8	9'.6	26'.9	11'.5	
26° 26'.8	10'.4	24° 34'.4	9'.7	15'.4	11'.6	
41° 26'.8	09'.6	39° 03'.1	9'.7	03'.8	11'.6	59'.0
56° 26'.8	08'.8	53° 31'.8	9'.8	7° 52'.2 S	11'.6	
71° 26'.8	08'.0	68° 00'.6	9'.9	40'.6	11'.6	
86° 26'.8	07'.2	82° 29'.5	9'.9	29'.0	11'.7	
101° 26'.8	06'.3	96° 58'.4	10'.0	17'.3	11'.7	58'.9
116° 26'.8	05'.5	111° 27'.4	10'.0	05'.6	11'.7	
131° 26'.8	04'.7	125° 56'.4	10'.1	6° 53'.9 S	11'.8	
146° 26'.8	03'.9	140° 25'.5	10'.2	42'.1	11'.8	58'.8
161° 26'.8	03'.0	154° 54'.7	10'.2	30'.3	11'.8	
176° 26'.8	14° 02'.2 S	169° 23'.9	10'.3	6° 18'.5 S	11'.9	58'.8
191° 26'.8	01'.4	183° 53'.2	10'.3	06'.6	11'.8	
206° 26'.8	00'.6	198° 22'.5	10'.4	5° 54'.8 S	11'.9	58'.7
221° 26'.8	13° 59'.8 S	212° 51'.9	10'.4	42'.9	11'.9	
236° 26'.8	58'.9	227° 21'.3	10'.5	31'.0	11'.9	
251° 26'.8	58'.1	241° 50'.8	10'.6	19'.1	12'.0	58'.6
266° 26'.8	57'.3	256° 20'.4	10'.6	07'.1	11'.9	
281° 26'.8	56'.5	270° 50'.0	10'.6	4° 55'.2 S	12'.0	
296° 26'.8	55'.6	285° 19'.6	10'.7	43'.2	12'.0	
311° 26'.8	54'.8	299° 49'.3	10'.8	31'.2	11'.9	58'.5
326° 26'.8	54'.0	314° 19'.1	10'.8	19'.3	12'.0	
341° 26'.8	53'.2	328° 48'.9	10'.9	07'.3	12'.0	
356° 26'.8	13° 52'.3 S	343° 18'.8	10'.9	3° 55'.3 S	12'.1	58'.4
11° 26'.8	51'.5	357° 48'.7	11'.0	43'.2	12'.0	
26° 26'.8	50'.7	12° 18'.7	11'.0	31'.2	12'.0	
41° 26'.8	49'.9	26° 48'.7	11'.0	19'.2	12'.0	58'.3
56° 26'.8	49'.0	41° 18'.7	11'.1	07'.2	12'.1	
71° 26'.8	48'.2	55° 48'.8	11'.2	2° 55'.1 S	12'.0	
86° 26'.8	47'.4	70° 19'.0	11'.2	43'.1	12'.0	
101° 26'.8	46'.5	84° 49'.2	11'.3	31'.1	12'.1	58'.2
116° 26'.8	45'.7	99° 19'.5	11'.3	19'.0	12'.0	
131° 26'.8	44'.9	113° 49'.8	11'.3	07'.0	12'.0	
146° 26'.8	44'.0	128° 20'.1	11'.4	1° 55'.0 S	12'.1	58'.1
161° 26'.8	43'.2	142° 50'.5	11'.4	42'.9	12'.0	
SD 16'.2	d 0'.8	SD	16'.2	16'.1	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11
N 72°	06:35	07:57	09:23	08:33	08:14	08:00
N 70°	06:31	07:44	08:57	08:07	07:59	07:53
68°	06:27	07:34	08:38	07:47	07:48	07:47
66°	06:24	07:25	08:23	07:31	07:38	07:43
64°	06:22	07:18	08:11	07:18	07:30	07:39
62°	06:19	07:12	08:00	07:07	07:23	07:35
60°	06:17	07:06	07:51	06:57	07:16	07:32
N 58°	06:15	07:01	07:43	06:49	07:11	07:30
56°	06:13	06:57	07:36	06:41	07:06	07:27
54°	06:11	06:53	07:30	06:34	07:02	07:25
52°	06:09	06:49	07:24	06:29	06:58	07:23
50°	06:07	06:45	07:19	06:23	06:54	07:22
45°	06:03	06:38	07:08	06:11	06:46	07:18
N 40°	05:59	06:31	06:59	06:02	06:40	07:14
35°	05:55	06:25	06:51	05:53	06:34	07:11
30°	05:51	06:19	06:44	05:46	06:29	07:09
20°	05:43	06:09	06:32	05:33	06:21	07:05
N 10°	05:34	05:59	06:21	05:22	06:13	07:01
0°	05:25	05:49	06:11	05:11	06:06	06:57
S 10°	05:13	05:39	06:00	05:01	05:58	06:54
20°	04:59	05:26	05:49	04:50	05:51	06:50
30°	04:41	05:11	05:36	04:37	05:42	06:45
35°	04:30	05:02	05:29	04:29	05:37	06:43
40°	04:16	04:51	05:20	04:21	05:31	06:40
45°	03:58	04:38	05:10	04:11	05:24	06:37
S 50°	03:36	04:22	04:58	03:58	05:16	06:33
52°	03:24	04:14	04:52	03:53	05:12	06:31
54°	03:11	04:05	04:46	03:47	05:08	06:29
56°	02:56	03:55	04:39	03:40	05:04	06:27
58°	02:36	03:43	04:31	03:32	04:59	06:24
S 60°	02:12	03:30	04:22	03:23	04:53	06:21
S 62°	01:35	03:13	04:11	03:12	04:46	06:18

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 9	Moonset 10	Moonset 11
N 72°	15:07	16:33	17:56	14:36	16:47	18:47
N 70°	15:32	16:46	17:59	15:01	16:59	18:51
68°	15:51	16:56	18:03	15:19	17:09	18:54
66°	16:06	17:04	18:06	15:34	17:17	18:56
64°	16:19	17:11	18:08	15:46	17:24	18:59
62°	16:29	17:18	18:10	15:56	17:30	19:01
60°	16:38	17:23	18:13	16:05	17:35	19:02
N 58°	16:46	17:28	18:15	16:12	17:39	19:04
56°	16:53	17:33	18:17	16:19	17:43	19:05
54°	16:59	17:37	18:18	16:25	17:47	19:06
52°	17:05	17:40	18:20	16:30	17:50	19:07
50°	17:10	17:44	18:22	16:35	17:53	19:08
45°	17:21	17:51	18:26	16:46	17:59	19:10
N 40°	17:30	17:58	18:30	16:54	18:04	19:12
35°	17:38	18:04	18:34	17:02	18:09	19:14
30°	17:45	18:09	18:38	17:08	18:12	19:15
20°	17:57	18:20	18:46	17:19	18:19	19:17
N 10°	18:08	18:29	18:54	17:29	18:25	19:19
0°	18:18	18:39	19:04	17:38	18:30	19:21
S 10°	18:28	18:50	19:15	17:46	18:36	19:23
20°	18:39	19:02	19:29	17:56	18:42	19:24
30°	18:52	19:17	19:47	18:07	18:48	19:27
35°	18:59	19:26	19:58	18:13	18:52	19:28
40°	19:07	19:37	20:12	18:20	18:56	19:29
45°	19:17	19:49	20:29	18:28	19:01	19:31
S 50°	19:30	20:06	20:51	18:37	19:06	19:32
52°	19:35	20:13	21:02	18:42	19:09	19:33
54°	19:41	20:22	21:15	18:46	19:12	19:34
56°	19:48	20:32	21:30	18:52	19:15	19:35
58°	19:56	20:43	21:49	18:58	19:18	19:36
S 60°	20:05	20:56	22:13	19:05	19:22	19:37
S 62°	20:15	21:12	22:46	19:12	19:27	19:39

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
9	14 11	14 12	12:14	11:25	23:52	29d 1%
10	14 12	14 13	12:14	12:18	24:44	0d 0%
11	14 13	14 13	12:14	13:09	00:44	1d 2%

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2013 February 12, 13, 14 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.4		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
12 Tuesday 00	142° 12'.5	187° 04'.9	18° 00'.4 S	162° 20'.1	9° 31'.9 S	77° 22'.1	20° 52'.1 N	282° 21'.8	12° 54'.1 S
01	157° 15'.0	202° 04'.2	17° 59'.6 S	177° 20'.7	31'.1	92° 24'.4	52'.2	297° 24'.2	54'.1
02	172° 17'.4	217° 03'.4	58'.8	192° 21'.3	30'.4	107° 26'.8	52'.2	312° 26'.6	54'.1
03	187° 19'.9	232° 02'.7	58'.0	207° 21'.9	29'.6	122° 29'.2	52'.2	327° 29'.0	54'.1
04	202° 22'.3	247° 02'.0	57'.2	222° 22'.5	28'.8	137° 31'.5	52'.3	342° 31'.5	54'.1
05	217° 24'.8	262° 01'.3	56'.4	237° 23'.2	28'.1	152° 33'.9	52'.3	357° 33'.9	54'.1
06	232° 27'.3	277° 00'.6	55'.5	252° 23'.8	27'.3	167° 36'.2	52'.3	12° 36'.3	54'.1
07	247° 29'.7	291° 59'.9	54'.7	267° 24'.4	26'.6	182° 38'.6	52'.3	27° 38'.8	54'.1
08	262° 32'.2	306° 59'.2	53'.9	282° 25'.0	25'.8	197° 40'.9	52'.4	42° 41'.2	54'.1
09	277° 34'.7	321° 58'.5	53'.1	297° 25'.6	25'.1	212° 43'.3	52'.4	57° 43'.6	54'.1
10	292° 37'.1	336° 57'.7	52'.3	312° 26'.2	24'.3	227° 45'.6	52'.4	72° 46'.1	54'.1
11	307° 39'.6	351° 57'.0	51'.5	327° 26'.9	23'.6	242° 48'.0	52'.4	87° 48'.5	54'.1
12	322° 42'.1	6° 56'.3	17° 50'.6 S	342° 27'.5	9° 22'.8 S	257° 50'.3	20° 52'.5 N	102° 51'.0	12° 54'.1 S
13	337° 44'.5	21° 55'.6	49'.8	357° 28'.1	22'.1	272° 52'.7	52'.5	117° 53'.4	54'.1
14	352° 47'.0	36° 54'.9	49'.0	12° 28'.7	21'.3	287° 55'.0	52'.5	132° 55'.8	54'.1
15	7° 49'.5	51° 54'.2	48'.2	27° 29'.3	20'.6	302° 57'.4	52'.6	147° 58'.3	54'.1
16	22° 51'.9	66° 53'.5	47'.3	42° 29'.9	19'.8	317° 59'.7	52'.6	163° 00'.7	54'.1
17	37° 54'.4	81° 52'.8	46'.5	57° 30'.6	19'.1	333° 02'.1	52'.6	178° 03'.1	54'.1
18	52° 56'.8	96° 52'.1	45'.7	72° 31'.2	18'.3	348° 04'.4	52'.6	193° 05'.6	54'.1
19	67° 59'.3	111° 51'.4	44'.9	87° 31'.8	17'.5	3° 06'.8	52'.7	208° 08'.0	54'.1
20	83° 01'.8	126° 50'.7	44'.0	102° 32'.4	16'.8	18° 09'.1	52'.7	223° 10'.4	54'.1
21	98° 04'.2	141° 50'.0	43'.2	117° 33'.0	16'.0	33° 11'.5	52'.7	238° 12'.9	54'.0
22	113° 06'.7	156° 49'.3	42'.4	132° 33'.7	15'.3	48° 13'.8	52'.8	253° 15'.3	54'.0
23	128° 09'.2	171° 48'.6	41'.5	147° 34'.3	14'.5	63° 16'.2	52'.8	268° 17'.7	54'.0
13 Wednesday 00	143° 11'.6	186° 47'.9	17° 40'.7 S	162° 34'.9	9° 13'.8 S	78° 18'.5	20° 52'.8 N	283° 20'.2	12° 54'.0 S
01	158° 14'.1	201° 47'.1	39'.9	177° 35'.5	13'.0	93° 20'.8	52'.8	298° 22'.6	54'.0
02	173° 16'.6	216° 46'.4	39'.1	192° 36'.1	12'.3	108° 23'.2	52'.9	313° 25'.1	54'.0
03	188° 19'.0	231° 45'.7	38'.2	207° 36'.8	11'.5	123° 25'.5	52'.9	328° 27'.5	54'.0
04	203° 21'.5	246° 45'.0	37'.4	222° 37'.4	10'.8	138° 27'.9	52'.9	343° 29'.9	54'.0
05	218° 23'.9	261° 44'.3	36'.5	237° 38'.0	10'.0	153° 30'.2	52'.9	358° 32'.4	54'.0
06	233° 26'.4	276° 43'.6	35'.7	252° 38'.6	09'.2	168° 32'.6	53'.0	13° 34'.8	54'.0
07	248° 28'.9	291° 42'.9	34'.9	267° 39'.2	08'.5	183° 34'.9	53'.0	28° 37'.2	54'.0
08	263° 31'.3	306° 42'.2	34'.0	282° 39'.8	07'.7	198° 37'.3	53'.0	43° 39'.7	54'.0
09	278° 33'.8	321° 41'.5	33'.2	297° 40'.5	07'.0	213° 39'.6	53'.1	58° 42'.1	54'.0
10	293° 36'.3	336° 40'.8	32'.4	312° 41'.1	06'.2	228° 41'.9	53'.1	73° 44'.6	54'.0
11	308° 38'.7	351° 40'.1	31'.5	327° 41'.7	05'.5	243° 44'.3	53'.1	88° 47'.0	54'.0
12	323° 41'.2	6° 39'.5	17° 30'.7 S	342° 42'.3	9° 04'.7 S	258° 46'.6	20° 53'.1 N	103° 49'.4	12° 54'.0 S
13	338° 43'.7	21° 38'.8	29'.8	357° 42'.9	03'.9	273° 49'.0	53'.2	118° 51'.9	54'.0
14	353° 46'.1	36° 38'.1	29'.0	12° 43'.6	03'.2	288° 51'.3	53'.2	133° 54'.3	54'.0
15	8° 48'.6	51° 37'.4	28'.1	27° 44'.2	02'.4	303° 53'.7	53'.2	148° 56'.8	54'.0
16	23° 51'.1	66° 36'.7	27'.3	42° 44'.8	01'.7	318° 56'.0	53'.3	163° 59'.2	54'.0
17	38° 53'.5	81° 36'.0	26'.4	57° 45'.4	00'.9	333° 58'.3	53'.3	179° 01'.6	54'.0
18	53° 56'.0	96° 35'.3	25'.6	72° 46'.1	00'.2	349° 00'.7	53'.3	194° 04'.1	54'.0
19	68° 58'.4	111° 34'.6	24'.8	87° 46'.7	8° 59'.4 S	4° 03'.0	53'.4	209° 06'.5	54'.0
20	84° 00'.9	126° 33'.9	23'.9	102° 47'.3	58'.6	19° 05'.4	53'.4	224° 08'.9	54'.0
21	99° 03'.4	141° 33'.2	23'.1	117° 47'.9	57'.9	34° 07'.7	53'.4	239° 11'.4	54'.0
22	114° 05'.8	156° 32'.5	22'.2	132° 48'.5	57'.1	49° 10'.0	53'.4	254° 13'.8	54'.0
23	129° 08'.3	171° 31'.8	21'.4	147° 49'.2	56'.4	64° 12'.4	53'.5	269° 16'.3	54'.0
14 Thursday 00	144° 10'.8	186° 31'.1	17° 20'.5 S	162° 49'.8	8° 55'.6 S	79° 14'.7	20° 53'.5 N	284° 18'.7	12° 54'.0 S
01	159° 13'.2	201° 30'.4	19'.7	177° 50'.4	54'.9	94° 17'.0	53'.5	299° 21'.2	54'.0
02	174° 15'.7	216° 29'.7	18'.8	192° 51'.0	54'.1	109° 19'.4	53'.6	314° 23'.6	54'.0
03	189° 18'.2	231° 29'.1	17'.9	207° 51'.7	53'.3	124° 21'.7	53'.6	329° 26'.0	54'.0
04	204° 20'.6	246° 28'.4	17'.1	222° 52'.3	52'.6	139° 24'.1	53'.6	344° 28'.5	54'.0
05	219° 23'.1	261° 27'.7	16'.2	237° 52'.9	51'.8	154° 26'.4	53'.6	359° 30'.9	54'.0
06	234° 25'.6	276° 27'.0	15'.4	252° 53'.5	51'.1	169° 28'.7	53'.7	14° 33'.4	54'.0
07	249° 28'.0	291° 26'.3	14'.5	267° 54'.1	50'.3	184° 31'.1	53'.7	29° 35'.8	54'.0
08	264° 30'.5	306° 25'.6	13'.7	282° 54'.8	49'.5	199° 33'.4	53'.7	44° 38'.2	54'.0
09	279° 32'.9	321° 24'.9	12'.8	297° 55'.4	48'.8	214° 35'.7	53'.8	59° 40'.7	53'.9
10	294° 35'.4	336° 24'.2	11'.9	312° 56'.0	48'.0	229° 38'.1	53'.8	74° 43'.1	53'.9
11	309° 37'.9	351° 23'.6	11'.1	327° 56'.6	47'.3	244° 40'.4	53'.8	89° 45'.6	53'.9
12	324° 40'.3	6° 22'.9	17° 10'.2 S	342° 57'.3	8° 46'.5 S	259° 42'.7	20° 53'.9 N	104° 48'.0	12° 53'.9 S
13	339° 42'.8	21° 22'.2	09'.3	357° 57'.9	45'.7	274° 45'.1	53'.9	119° 50'.5	53'.9
14	354° 45'.3	36° 21'.5	08'.5	12° 58'.5	45'.0	289° 47'.4	53'.9	134° 52'.9	53'.9
15	9° 47'.7	51° 20'.8	07'.6	27° 59'.1	44'.2	304° 49'.7	53'.9	149° 55'.3	53'.9
16	24° 50'.2	66° 20'.1	06'.8	42° 59'.8	43'.5	319° 52'.1	54'.0	164° 57'.8	53'.9
17	39° 52'.7	81° 19'.5	05'.9	58° 00'.4	42'.7	334° 54'.4	54'.0	180° 00'.2	53'.9
18	54° 55'.1	96° 18'.8	05'.0	73° 01'.0	41'.9	349° 56'.7	54'.0	195° 02'.7	53'.9
19	69° 57'.6	111° 18'.1	04'.2	88° 01'.6	41'.2	4° 59'.1	54'.1	210° 05'.1	53'.9
20	85° 00'.0	126° 17'.4	03'.3	103° 02'.3	40'.4	20° 01'.4	54'.1	225° 07'.6	53'.9
21	100° 02'.5	141° 16'.7	02'.4	118° 02'.9	39'.7	35° 03'.7	54'.1	240° 10'.0	53'.9
22	115° 05'.0	156° 16'.1	01'.5	133° 03'.5	38'.9	50° 06'.1	54'.2	255° 12'.5	53'.9
23	130° 07'.4	171° 15'.4	00'.7	148° 04'.1	38'.1	65° 08'.4	54'.2	270° 14'.9	53'.9
	M.P. 14:25	v -0'.7	d 0'.8	v 0'.6	d 0'.8	v 2'.3	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.6	40° 15'.4 S
Achernar	335° 27'.2	57° 10'.5 S
Acrux	173° 09'.0	63° 10'.2 S
Adhara	255° 12'.4	28° 59'.7 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.5	55° 53'.0 N
Alkaid	152° 58'.9	49° 14'.5 N
Alnair	27° 44'.5	46° 53'.8 S
Alnilam	275° 46'.4	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.2	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.9 N
Altair	62° 08'.7	8° 54'.2 N
Ankaa	353° 16'.2	42° 14'.2 S
Antares	112° 26'.6	26° 27'.5 S
Arcturus	145° 55'.8	19° 06'.6 N
Atria	107° 28'.8	69° 02'.7 S
Avior	234° 17'.5	59° 33'.4 S
Bellatrix	278° 32'.1	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.3 N
Canopus	263° 55'.9	52° 42'.6 S
Capella	280° 34'.5	46° 00'.7 N
Deneb	49° 32'.1	45° 19'.7 N
Denebola	182° 33'.6	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.4	61° 40'.5 N
Elnath	278° 12'.7	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.1 N
Enif	33° 47'.6	9° 56'.2 N
Fomalhaut	15° 24'.6	29° 33'.2 S
Gacrux	172° 00'.7	57° 11'.1 S
Gienah	175° 52'.2	17° 37'.0 S
Hadar	148° 47'.9	60° 26'.0 S
Hamal	328° 01'.1	23° 31'.5 N
Kaus Aust.	83° 44'.4	34° 22'.5 S
Kochab	137° 19'.9	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.3	4° 08'.3 N
Menkent	148° 07'.7	36° 26'.0 S
Miaplacidus	221° 38'.7	69° 46'.5 S
Mirfak	308° 40'.6	49° 54'.6 N
Nunki	75° 58'.9	26° 16'.7 S
Peacock	53° 20'.1	56° 41'.4 S
Polaris	317° 57'.3	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.8	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.1	8° 11'.5 S
Rigil Kent	139° 51'.8	60° 53'.1 S
Sabik	102° 12'.9	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.8 N
Shaula	96° 22'.4	37° 06'.6 S
Sirius	258° 33'.6	16° 44'.4 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.4 S
Vega	80° 39'.4	38° 47'.7 N
Zuben'ubi	137° 05'.6	16° 05'.8 S

	SHA	Mer.Pass.
Venus	43° 36'.2	11:33
Mars	19° 23'.3	13:09
Jupiter	295° 06'.9	18:44
Saturn	140° 08'.6	05:06

SUN				MOON				
GHA	Dec	GHA	v	Dec	d	HP
176° 26'.8	13° 42'.4 S	157° 20'.9	11'.5	1° 30'.9 S	12'.0	58'.1
191° 26'.8	41'.6	171° 51'.4	11'.5	18'.9	12'.0	58'.0
206° 26'.8	40'.7	186° 21'.9	11'.6	06'.9	12'.0	
221° 26'.8	39'.9	200° 52'.5	11'.6	0° 54'.9 S	12'.0	
236° 26'.8	39'.1	215° 23'.1	11'.6	42'.9	12'.0	57'.9
251° 26'.8	38'.2	229° 53'.7	11'.7	30'.9	11'.9	
266° 26'.9	37'.4	244° 24'.4	11'.7	19'.0	12'.0	
281° 26'.9	36'.6	258° 55'.1	11'.7	07'.0	11'.9	57'.8
296° 26'.9	35'.7	273° 25'.8	11'.8	0° 04'.9 N	12'.0	
311° 26'.9	34'.9	287° 56'.6	11'.9	16'.9	11'.9	
326° 26'.9	34'.0	302° 27'.5	11'.8	28'.8	11'.9	57'.7
341° 26'.9	33'.2	316° 58'.3	11'.9	40'.7	11'.8	
356° 26'.9	13° 32'.4 S	331° 29'.2	12'.0	0° 52'.5 N	11'.9	57'.7
11° 26'.9	31'.5	346° 00'.2	11'.9	1° 04'.4 N	11'.8	57'.6
26° 26'.9	30'.7	0° 31'.1	12'.0	16'.2	11'.8	
41° 26'.9	29'.9	15° 02'.1	12'.1	28'.0	11'.8	
56° 26'.9	29'.0	29° 33'.2	12'.0	39'.8	11'.8	57'.5
71° 27'.0	28'.2	44° 04'.2	12'.1	51'.6	11'.7	
86° 27'.0	27'.4	58° 35'.3	12'.2	2° 03'.3 N	11'.7	
101° 27'.0	26'.5	73° 06'.5	12'.1	15'.0	11'.7	57'.4
116° 27'.0	25'.7	87° 37'.6	12'.2	26'.7	11'.7	
131° 27'.0	24'.8	102° 08'.8	12'.2	38'.4	11'.6	
146° 27'.0	24'.0	116° 40'.0	12'.3	50'.0	11'.6	57'.3
161° 27'.0	23'.2	131° 11'.3	12'.2	3° 01'.6 N	11'.6	
176° 27'.0	13° 22'.3 S	145° 42'.5	12'.3	3° 13'.2 N	11'.6	57'.3
191° 27'.1	21'.5	160° 13'.8	12'.4	24'.8	11'.5	57'.2
206° 27'.1	20'.6	174° 45'.2	12'.3	36'.3	11'.5	
221° 27'.1	19'.8	189° 16'.5	12'.4	47'.8	11'.4	
236° 27'.1	19'.0	203° 47'.9	12'.4	59'.2	11'.4	57'.1
251° 27'.1	18'.1	218° 19'.3	12'.4	4° 10'.6 N	11'.4	
266° 27'.1	17'.3	232° 50'.7	12'.5	22'.0	11'.3	
281° 27'.1	16'.4	247° 22'.2	12'.4	33'.3	11'.4	57'.0
296° 27'.2	15'.6	261° 53'.6	12'.5	44'.7	11'.2	
311° 27'.2	14'.7	276° 25'.1	12'.5	55'.9	11'.3	
326° 27'.2	13'.9	290° 56'.6	12'.6	5° 07'.2 N	11'.1	56'.9
341° 27'.2	13'.0	305° 28'.2	12'.5	18'.3	11'.2	
356° 27'.2	13° 12'.2 S	319° 59'.7	12'.6	5° 29'.5 N	11'.1	56'.9
11° 27'.3	11'.4	334° 31'.3	12'.6	40'.6	11'.1	56'.8
26° 27'.3	10'.5	349° 02'.9	12'.6	51'.7	11'.0	
41° 27'.3	09'.7	3° 34'.5	12'.6	6° 02'.7 N	11'.0	
56° 27'.3	08'.8	18° 06'.1	12'.7	13'.7	10'.9	56'.7
71° 27'.3	08'.0	32° 37'.8	12'.6	24'.6	10'.9	
86° 27'.3	07'.1	47° 09'.4	12'.7	35'.5	10'.9	
101° 27'.4	06'.3	61° 41'.1	12'.7	46'.4	10'.8	56'.6
116° 27'.4	05'.4	76° 12'.8	12'.7	57'.2	10'.8	
131° 27'.4	04'.6	90° 44'.5	12'.7	7° 08'.0 N	10'.7	
146° 27'.4	03'.7	105° 16'.2	12'.7	18'.7	10'.6	56'.5
161° 27'.4	02'.9	119° 47'.9	12'.8	29'.3	10'.7	
176° 27'.5	13° 02'.0 S	134° 19'.7	12'.7	7° 40'.0 N	10'.5	56'.5
191° 27'.5	01'.2	148° 51'.4	12'.8	50'.5	10'.5	
206° 27'.5	00'.3	163° 23'.2	12'.8	8° 01'.0 N	10'.5	56'.4
221° 27'.5	12° 59'.5 S	177° 55'.0	12'.7	11'.5	10'.4	
236° 27'.6	58'.6	192° 26'.7	12'.8	21'.9	10'.4	
251° 27'.6	57'.8	206° 58'.5	12'.8	32'.3	10'.3	56'.3
266° 27'.6	56'.9	221° 30'.3	12'.8	42'.6	10'.2	
281° 27'.6	56'.1	236° 02'.1	12'.9	52'.8	10'.2	
296° 27'.6	55'.2	250° 34'.0	12'.8	9° 03'.0 N	10'.2	56'.2
311° 27'.7	54'.4	265° 05'.8	12'.8	13'.2	10'.1	
326° 27'.7	53'.5	279° 37'.6	12'.9	23'.3	10'.0	
341° 27'.7	52'.7	294° 09'.5	12'.8	33'.3	10'.0	56'.1
356° 27'.7	12° 51'.8 S	308° 41'.3	12'.9	9° 43'.3 N	9'.9	56'.1
11° 27'.8	51'.0	323° 13'.2	12'.8	53'.2	9'.9	
26° 27'.8	50'.1	337° 45'.0	12'.9	10° 03'.1 N	9'.8	56'.0
41° 27'.8	49'.2	352° 16'.9	12'.8	12'.9	9'.7	
56° 27'.9	48'.4	6° 48'.7	12'.9	22'.6	9'.7	
71° 27'.9	47'.5	21° 20'.6	12'.9	32'.3	9'.6	
86° 27'.9	46'.7	35° 52'.5	12'.9	41'.9	9'.6	55'.9
101° 27'.9	45'.8	50° 24'.4	12'.8	51'.5	9'.5	
116° 28'.0	45'.0	64° 56'.2	12'.9	11° 01'.0 N	9'.4	
131° 28'.0	44'.1	79° 28'.1	12'.9	10'.4	9'.4	55'.8
146° 28'.0	43'.3	94° 00'.0	12'.9	19'.8	9'.3	
161° 28'.0	42'.4	108° 31'.9	12'.8	29'.1	9'.3	
SD 16'.2	d 0'.8	SD	15'.7	15'.5	15'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14
N 72°	06:22	07:43	09:04	07:47	07:35	07:22
N 70°	06:20	07:32	08:43	07:47	07:41	07:36
68°	06:17	07:23	08:26	07:47	07:46	07:46
66°	06:15	07:16	08:12	07:47	07:51	07:55
64°	06:13	07:09	08:01	07:47	07:54	08:03
62°	06:12	07:04	07:51	07:47	07:58	08:09
60°	06:10	06:59	07:43	07:47	08:00	08:15
N 58°	06:08	06:54	07:36	07:47	08:03	08:20
56°	06:07	06:50	07:30	07:47	08:05	08:24
54°	06:05	06:47	07:24	07:47	08:07	08:28
52°	06:04	06:44	07:19	07:47	08:09	08:32
50°	06:03	06:40	07:14	07:46	08:11	08:35
45°	05:59	06:33	07:04	07:46	08:14	08:43
N 40°	05:56	06:27	06:55	07:46	08:17	08:49
35°	05:52	06:22	06:48	07:46	08:20	08:54
30°	05:49	06:17	06:42	07:46	08:23	08:59
20°	05:42	06:08	06:30	07:46	08:27	09:07
N 10°	05:34	05:59	06:20	07:46	08:30	09:14
0°	05:25	05:50	06:11	07:46	08:34	09:21
S 10°	05:14	05:40	06:01	07:46	08:38	09:28
20°	05:01	05:28	05:51	07:46	08:41	09:35
30°	04:44	05:14	05:39	07:47	08:46	09:43
35°	04:33	05:05	05:32	07:47	08:48	09:48
40°	04:20	04:55	05:24	07:47	08:51	09:54
45°	04:04	04:43	05:15	07:47	08:55	10:00
S 50°	03:43	04:27	05:03	07:47	08:59	10:08
52°	03:32	04:20	04:58	07:47	09:01	10:12
54°	03:20	04:12	04:52	07:47	09:03	10:16
56°	03:06	04:03	04:46	07:47	09:05	10:20
58°	02:48	03:52	04:38	07:47	09:07	10:25
S 60°	02:26	03:39	04:30	07:47	09:10	10:31
S 62°	01:57	03:25	04:20	07:47	09:14	10:37

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 12	Moonset 13	Moonset 14
N 72°	15:26	16:47	18:08	20:41	22:33	24:25
N 70°	15:47	16:58	18:11	20:37	22:21	24:04
68°	16:04	17:07	18:13	20:35	22:12	23:48
66°	16:17	17:14	18:15	20:32	22:05	23:35
64°	16:29	17:20	18:16	20:30	21:59	23:25
62°	16:38	17:26	18:18	20:28	21:53	23:16
60°	16:46	17:31	18:20	20:27	21:49	23:08
N 58°	16:53	17:35	18:21	20:26	21:45	23:01
56°	17:00	17:39	18:23	20:24	21:41	22:55
54°	17:05	17:42	18:24	20:23	21:38	22:50
52°	17:10	17:46	18:25	20:22	21:35	22:45
50°	17:15	17:49	18:27	20:21	21:32	22:40
45°	17:25	17:56	18:30	20:19	21:26	22:31
N 40°	17:34	18:01	18:33	20:18	21:21	22:23
35°	17:41	18:07	18:37	20:16	21:17	22:16
30°	17:47	18:12	18:40	20:15	21:14	22:10
20°	17:58	18:21	18:47	20:13	21:07	22:00
N 10°	18:08	18:30	18:55	20:11	21:02	21:51
0°	18:18	18:39	19:03	20:09	20:56	21:43
S 10°	18:27	18:49	19:14	20:07	20:51	21:35
20°	18:37	19:00	19:27	20:06	20:46	21:26
30°	18:49	19:14	19:44	20:03	20:39	21:16
35°	18:56	19:23	19:54	20:02	20:36	21:10
40°	19:04	19:33	20:07	20:01	20:32	21:03
45°	19:13	19:45	20:23	19:59	20:27	20:56
S 50°	19:24	20:00	20:44	19:57	20:21	20:47
52°	19:29	20:07	20:55	19:56	20:19	20:42
54°	19:35	20:15	21:06	19:55	20:16	20:38
56°	19:41	20:24	21:20	19:54	20:13	20:33
58°	19:49	20:34	21:37	19:53	20:09	20:27
S 60°	19:57	20:47	21:58	19:51	20:05	20:21
S 62°	20:06	21:01	22:26	19:50	20:01	20:13

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
12	14 13	14 12	12:14	13:58	01:34	2d 6%
13	14 12	14 11	12:14	14:45	02:22	3d 12%
14	14 10	14 09	12:14	15:32	03:09	4d 20%

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2013 February 15, 16, 17 (Fri, Saw, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.4		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
15 Friday 00	145° 09'.9	186° 14'.7	16° 59'.8 S	163° 04'.8	8° 37'.4 S	80° 10'.7	20° 54'.2 N	285° 17'.3	12° 53'.9 S
01	160° 12'.4	201° 14'.0	58'.9	178° 05'.4	36'.6	95° 13'.0	54'.3	300° 19'.8	53'.9
02	175° 14'.8	216° 13'.3	58'.1	193° 06'.0	35'.9	110° 15'.4	54'.3	315° 22'.2	53'.9
03	190° 17'.3	231° 12'.7	57'.2	208° 06'.6	35'.1	125° 17'.7	54'.3	330° 24'.7	53'.9
04	205° 19'.8	246° 12'.0	56'.3	223° 07'.3	34'.3	140° 20'.0	54'.3	345° 27'.1	53'.9
05	220° 22'.2	261° 11'.3	55'.4	238° 07'.9	33'.6	155° 22'.4	54'.4	0° 29'.6	53'.9
06	235° 24'.7	276° 10'.6	54'.5	253° 08'.5	32'.8	170° 24'.7	54'.4	15° 32'.0	53'.9
07	250° 27'.2	291° 10'.0	53'.7	268° 09'.1	32'.0	185° 27'.0	54'.4	30° 34'.5	53'.8
08	265° 29'.6	306° 09'.3	52'.8	283° 09'.8	31'.3	200° 29'.3	54'.5	45° 36'.9	53'.8
09	280° 32'.1	321° 08'.6	51'.9	298° 10'.4	30'.5	215° 31'.7	54'.5	60° 39'.4	53'.8
10	295° 34'.5	336° 07'.9	51'.0	313° 11'.0	29'.8	230° 34'.0	54'.5	75° 41'.8	53'.8
11	310° 37'.0	351° 07'.3	50'.1	328° 11'.7	29'.0	245° 36'.3	54'.6	90° 44'.3	53'.8
12	325° 39'.5	6° 06'.6	16° 49'.3 S	343° 12'.3	8° 28'.2 S	260° 38'.6	20° 54'.6 N	105° 46'.7	12° 53'.8 S
13	340° 41'.9	21° 05'.9	48'.4	358° 12'.9	27'.5	275° 41'.0	54'.6	120° 49'.1	53'.8
14	355° 44'.4	36° 05'.3	47'.5	13° 13'.5	26'.7	290° 43'.3	54'.7	135° 51'.6	53'.8
15	10° 46'.9	51° 04'.6	46'.6	28° 14'.2	25'.9	305° 45'.6	54'.7	150° 54'.0	53'.8
16	25° 49'.3	66° 03'.9	45'.7	43° 14'.8	25'.2	320° 47'.9	54'.7	165° 56'.5	53'.8
17	40° 51'.8	81° 03'.2	44'.8	58° 15'.4	24'.4	335° 50'.3	54'.8	180° 58'.9	53'.8
18	55° 54'.3	96° 02'.6	44'.0	73° 16'.1	23'.7	350° 52'.6	54'.8	196° 01'.4	53'.8
19	70° 56'.7	111° 01'.9	43'.1	88° 16'.7	22'.9	5° 54'.9	54'.8	211° 03'.8	53'.8
20	85° 59'.2	126° 01'.2	42'.2	103° 17'.3	22'.1	20° 57'.2	54'.8	226° 06'.3	53'.8
21	101° 01'.6	141° 00'.6	41'.3	118° 17'.9	21'.4	35° 59'.6	54'.9	241° 08'.7	53'.8
22	116° 04'.1	155° 59'.9	40'.4	133° 18'.6	20'.6	51° 01'.9	54'.9	256° 11'.2	53'.8
23	131° 06'.6	170° 59'.2	39'.5	148° 19'.2	19'.8	66° 04'.2	54'.9	271° 13'.6	53'.8
16 Saturday 00	146° 09'.0	185° 58'.6	16° 38'.6 S	163° 19'.8	8° 19'.1 S	81° 06'.5	20° 55'.0 N	286° 16'.1	12° 53'.8 S
01	161° 11'.5	200° 57'.9	37'.7	178° 20'.5	18'.3	96° 08'.8	55'.0	301° 18'.5	53'.8
02	176° 14'.0	215° 57'.2	36'.8	193° 21'.1	17'.5	111° 11'.2	55'.0	316° 21'.0	53'.7
03	191° 16'.4	230° 56'.6	35'.9	208° 21'.7	16'.8	126° 13'.5	55'.1	331° 23'.4	53'.7
04	206° 18'.9	245° 55'.9	35'.0	223° 22'.3	16'.0	141° 15'.8	55'.1	346° 25'.9	53'.7
05	221° 21'.4	260° 55'.2	34'.1	238° 23'.0	15'.2	156° 18'.1	55'.1	1° 28'.3	53'.7
06	236° 23'.8	275° 54'.6	33'.2	253° 23'.6	14'.5	171° 20'.4	55'.2	16° 30'.8	53'.7
07	251° 26'.3	290° 53'.9	32'.3	268° 24'.2	13'.7	186° 22'.8	55'.2	31° 33'.2	53'.7
08	266° 28'.8	305° 53'.3	31'.5	283° 24'.9	13'.0	201° 25'.1	55'.2	46° 35'.7	53'.7
09	281° 31'.2	320° 52'.6	30'.6	298° 25'.5	12'.2	216° 27'.4	55'.3	61° 38'.1	53'.7
10	296° 33'.7	335° 51'.9	29'.7	313° 26'.1	11'.4	231° 29'.7	55'.3	76° 40'.6	53'.7
11	311° 36'.1	350° 51'.3	28'.8	328° 26'.8	10'.7	246° 32'.0	55'.3	91° 43'.0	53'.7
12	326° 38'.6	5° 50'.6	16° 27'.8 S	343° 27'.4	8° 09'.9 S	261° 34'.3	20° 55'.4 N	106° 45'.5	12° 53'.7 S
13	341° 41'.1	20° 50'.0	26'.9	358° 28'.0	09'.1	276° 36'.7	55'.4	121° 47'.9	53'.7
14	356° 43'.5	35° 49'.3	26'.0	13° 28'.7	08'.4	291° 39'.0	55'.4	136° 50'.4	53'.7
15	11° 46'.0	50° 48'.6	25'.1	28° 29'.3	07'.6	306° 41'.3	55'.5	151° 52'.8	53'.7
16	26° 48'.5	65° 48'.0	24'.2	43° 29'.9	06'.8	321° 43'.6	55'.5	166° 55'.3	53'.7
17	41° 50'.9	80° 47'.3	23'.3	58° 30'.5	06'.1	336° 45'.9	55'.5	181° 57'.7	53'.6
18	56° 53'.4	95° 46'.7	22'.4	73° 31'.2	05'.3	351° 48'.2	55'.6	197° 00'.2	53'.6
19	71° 55'.9	110° 46'.0	21'.5	88° 31'.8	04'.5	6° 50'.5	55'.6	212° 02'.7	53'.6
20	86° 58'.3	125° 45'.4	20'.6	103° 32'.4	03'.8	21° 52'.9	55'.6	227° 05'.1	53'.6
21	102° 00'.8	140° 44'.7	19'.7	118° 33'.1	03'.0	36° 55'.2	55'.7	242° 07'.6	53'.6
22	117° 03'.3	155° 44'.0	18'.8	133° 33'.7	02'.2	51° 57'.5	55'.7	257° 10'.0	53'.6
23	132° 05'.7	170° 43'.4	17'.9	148° 34'.3	01'.5	66° 59'.8	55'.7	272° 12'.5	53'.6
17 Sunday 00	147° 08'.2	185° 42'.7	16° 17'.0 S	163° 35'.0	8° 00'.7 S	82° 02'.1	20° 55'.8 N	287° 14'.9	12° 53'.6 S
01	162° 10'.6	200° 42'.1	16'.1	178° 35'.6	7° 59'.9 S	97° 04'.4	55'.8	302° 17'.4	53'.6
02	177° 13'.1	215° 41'.4	15'.1	193° 36'.2	59'.2	112° 06'.7	55'.8	317° 19'.8	53'.6
03	192° 15'.6	230° 40'.8	14'.2	208° 36'.9	58'.4	127° 09'.0	55'.9	332° 22'.3	53'.6
04	207° 18'.0	245° 40'.1	13'.3	223° 37'.5	57'.6	142° 11'.4	55'.9	347° 24'.7	53'.6
05	222° 20'.5	260° 39'.5	12'.4	238° 38'.1	56'.9	157° 13'.7	55'.9	2° 27'.2	53'.6
06	237° 23'.0	275° 38'.8	11'.5	253° 38'.8	56'.1	172° 16'.0	56'.0	17° 29'.6	53'.6
07	252° 25'.4	290° 38'.2	10'.6	268° 39'.4	55'.3	187° 18'.3	56'.0	32° 32'.1	53'.5
08	267° 27'.9	305° 37'.5	09'.6	283° 40'.0	54'.6	202° 20'.6	56'.0	47° 34'.6	53'.5
09	282° 30'.4	320° 36'.9	08'.7	298° 40'.7	53'.8	217° 22'.9	56'.1	62° 37'.0	53'.5
10	297° 32'.8	335° 36'.2	07'.8	313° 41'.3	53'.0	232° 25'.2	56'.1	77° 39'.5	53'.5
11	312° 35'.3	350° 35'.6	06'.9	328° 41'.9	52'.2	247° 27'.5	56'.1	92° 41'.9	53'.5
12	327° 37'.7	5° 34'.9	16° 06'.0 S	343° 42'.6	7° 51'.5 S	262° 29'.8	20° 56'.2 N	107° 44'.4	12° 53'.5 S
13	342° 40'.2	20° 34'.3	05'.0	358° 43'.2	50'.7	277° 32'.1	56'.2	122° 46'.8	53'.5
14	357° 42'.7	35° 33'.6	04'.1	13° 43'.8	49'.9	292° 34'.5	56'.2	137° 49'.3	53'.5
15	12° 45'.1	50° 33'.0	03'.2	28° 44'.5	49'.2	307° 36'.8	56'.3	152° 51'.7	53'.5
16	27° 47'.6	65° 32'.3	02'.3	43° 45'.1	48'.4	322° 39'.1	56'.3	167° 54'.2	53'.5
17	42° 50'.1	80° 31'.7	01'.4	58° 45'.8	47'.6	337° 41'.4	56'.3	182° 56'.7	53'.5
18	57° 52'.5	95° 31'.1	00'.4	73° 46'.4	46'.9	352° 43'.7	56'.4	197° 59'.1	53'.5
19	72° 55'.0	110° 30'.4	15° 59'.5 S	88° 47'.0	46'.1	7° 46'.0	56'.4	213° 01'.6	53'.5
20	87° 57'.5	125° 29'.8	58'.6	103° 47'.7	45'.3	22° 48'.3	56'.4	228° 04'.0	53'.4
21	102° 59'.9	140° 29'.1	57'.7	118° 48'.3	44'.6	37° 50'.6	56'.5	243° 06'.5	53'.4
22	118° 02'.4	155° 28'.5	56'.7	133° 48'.9	43'.8	52° 52'.9	56'.5	258° 08'.9	53'.4
23	133° 04'.9	170° 27'.8	55'.8	148° 49'.6	43'.0	67° 55'.2	56'.5	273° 11'.4	53'.4
	M.P. 14:13	v -0'.7	d 0'.9	v 0'.6	d 0'.8	v 2'.3	d 0'.0	v 2'.5	d 0'.0

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 18'.6	40° 15'.4 S	176° 28'.1	12° 41'.5 S	123° 03'.7	12'.9	11° 38'.4 N	9'.2	55'.8
Achernar	335° 27'.3	57° 10'.5 S	191° 28'.1	40'.7	137° 35'.6	12'.9	47'.6	9'.1	55'.7
Acrux	173° 09'.0	63° 10'.2 S	206° 28'.1	39'.8	152° 07'.5	12'.9	56'.7	9'.1	
Adhara	255° 12'.4	28° 59'.8 S	221° 28'.2	39'.0	166° 39'.4	12'.9	12° 05'.8 N	8'.9	
Aldebaran	290° 49'.5	16° 32'.0 N	236° 28'.2	38'.1	181° 11'.3	12'.8	14'.7	9'.0	55'.6
			251° 28'.2	37'.2	195° 43'.1	12'.9	23'.7	8'.8	
Alioth	166° 20'.5	55° 53'.0 N	266° 28'.3	36'.4	210° 15'.0	12'.9	32'.5	8'.8	
Alkaid	152° 58'.8	49° 14'.5 N	281° 28'.3	35'.5	224° 46'.9	12'.8	41'.3	8'.8	
Alnair	27° 44'.5	46° 53'.8 S	296° 28'.3	34'.7	239° 18'.7	12'.9	50'.1	8'.6	55'.5
Alnilam	275° 46'.4	1° 11'.9 S	311° 28'.4	33'.8	253° 50'.6	12'.8	58'.7	8'.6	
Alphard	217° 56'.0	8° 43'.2 S	326° 28'.4	32'.9	268° 22'.4	12'.9	13° 07'.3 N	8'.5	
			341° 28'.4	32'.1	282° 54'.3	12'.8	15'.8	8'.5	
Alphecca	126° 11'.2	26° 40'.0 N	356° 28'.5	12° 31'.2 S	297° 26'.1	12'.9	13° 24'.3 N	8'.3	55'.4
Alpheratz	357° 44'.0	29° 09'.9 N	11° 28'.5	30'.3	311° 58'.0	12'.8	32'.6	8'.3	
Altair	62° 08'.7	8° 54'.2 N	26° 28'.5	29'.5	326° 29'.8	12'.9	40'.9	8'.3	
Ankaa	353° 16'.2	42° 14'.2 S	41° 28'.6	28'.6	341° 01'.7	12'.8	49'.2	8'.1	
Antares	112° 26'.6	26° 27'.5 S	56° 28'.6	27'.8	355° 33'.5	12'.8	57'.3	8'.1	55'.3
			71° 28'.6	26'.9	10° 05'.3	12'.8	14° 05'.4 N	8'.1	
Arcturus	145° 55'.8	19° 06'.6 N	86° 28'.7	26'.0	24° 37'.1	12'.8	13'.5	7'.9	
Atria	107° 28'.7	69° 02'.7 S	101° 28'.7	25'.2	39° 08'.9	12'.8	21'.4	7'.9	
Avior	234° 17'.5	59° 33'.4 S	116° 28'.7	24'.3	53° 40'.7	12'.8	29'.3	7'.8	55'.2
Bellatrix	278° 32'.1	6° 21'.5 N	131° 28'.8	23'.4	68° 12'.5	12'.8	37'.1	7'.7	
Betelgeuse	271° 01'.3	7° 24'.3 N	146° 28'.8	22'.6	82° 44'.3	12'.8	44'.8	7'.7	
			161° 28'.8	21'.7	97° 16'.1	12'.7	52'.5	7'.5	
Canopus	263° 55'.9	52° 42'.6 S	176° 28'.9	12° 20'.8 S	111° 47'.8	12'.8	15° 00'.0 N	7'.5	55'.1
Capella	280° 34'.5	46° 00'.7 N	191° 28'.9	20'.0	126° 19'.6	12'.7	07'.5	7'.5	
Deneb	49° 32'.0	45° 19'.7 N	206° 28'.9	19'.1	140° 51'.3	12'.8	15'.0	7'.3	
Denebola	182° 33'.6	14° 29'.7 N	221° 29'.0	18'.2	155° 23'.1	12'.7	22'.3	7'.3	
Diphda	348° 56'.3	17° 55'.0 S	236° 29'.0	17'.4	169° 54'.8	12'.7	29'.6	7'.2	55'.0
			251° 29'.1	16'.5	184° 26'.5	12'.7	36'.8	7'.1	
Dubhe	193° 51'.3	61° 40'.5 N	266° 29'.1	15'.6	198° 58'.2	12'.7	43'.9	7'.0	
Elnath	278° 12'.7	28° 37'.0 N	281° 29'.1	14'.8	213° 29'.9	12'.7	50'.9	7'.0	
Eltanin	90° 46'.5	51° 29'.1 N	296° 29'.2	13'.9	228° 01'.6	12'.7	57'.9	6'.9	
Enif	33° 47'.6	9° 56'.2 N	311° 29'.2	13'.0	242° 33'.3	12'.7	16° 04'.8 N	6'.8	54'.9
Fomalhaut	15° 24'.6	29° 33'.2 S	326° 29'.3	12'.2	257° 05'.0	12'.6	11'.6	6'.7	
			341° 29'.3	11'.3	271° 36'.6	12'.7	18'.3	6'.7	
Gacrux	172° 00'.6	57° 11'.2 S	356° 29'.3	12° 10'.4 S	286° 08'.3	12'.6	16° 25'.0 N	6'.5	54'.9
Gienah	175° 52'.2	17° 37'.0 S	11° 29'.4	09'.5	300° 39'.9	12'.6	31'.5	6'.5	
Hadar	148° 47'.9	60° 26'.0 S	26° 29'.4	08'.7	315° 11'.5	12'.6	38'.0	6'.4	54'.8
Hamal	328° 01'.1	23° 31'.5 N	41° 29'.5	07'.8	329° 43'.1	12'.6	44'.4	6'.3	
Kaus Aust.	83° 44'.3	34° 22'.5 S	56° 29'.5	06'.9	344° 14'.7	12'.6	50'.7	6'.3	
			71° 29'.5	06'.1	358° 46'.3	12'.6	57'.0	6'.1	
Kochab	137° 19'.8	74° 05'.8 N	86° 29'.6	05'.2	13° 17'.9	12'.5	17° 03'.1 N	6'.1	
Markab	13° 38'.8	15° 16'.6 N	101° 29'.6	04'.3	27° 49'.4	12'.6	09'.2	6'.0	54'.7
Menkar	314° 15'.3	4° 08'.3 N	116° 29'.7	03'.4	42° 21'.0	12'.5	15'.2	5'.9	
Menkent	148° 07'.6	36° 26'.0 S	131° 29'.7	02'.6	56° 52'.5	12'.6	21'.1	5'.9	
Miaplacidus	221° 38'.7	69° 46'.5 S	146° 29'.8	01'.7	71° 24'.1	12'.5	27'.0	5'.7	
			161° 29'.8	00'.8	85° 55'.6	12'.5	32'.7	5'.7	
Mirfak	308° 40'.6	49° 54'.6 N	176° 29'.8	11° 59'.9 S	100° 27'.1	12'.5	17° 38'.4 N	5'.5	54'.7
Nunki	75° 58'.8	26° 16'.7 S	191° 29'.9	59'.1	114° 58'.6	12'.4	43'.9	5'.5	54'.6
Peacock	53° 20'.1	56° 41'.4 S	206° 29'.9	58'.2	129° 30'.0	12'.5	49'.4	5'.4	
Polaris	317° 58'.6	89° 19'.5 N	221° 30'.0	57'.3	144° 01'.5	12'.4	54'.8	5'.4	
Pollux	243° 27'.7	27° 59'.5 N	236° 30'.0	56'.4	158° 32'.9	12'.5	18° 00'.2 N	5'.2	
			251° 30'.1	55'.6	173° 04'.4	12'.4	05'.4	5'.2	
Procyon	244° 59'.7	5° 11'.2 N	266° 30'.1	54'.7	187° 35'.8	12'.4	10'.6	5'.0	
Rasalhague	96° 06'.8	12° 33'.0 N	281° 30'.2	53'.8	202° 07'.2	12'.4	15'.6	5'.0	
Regulus	207° 43'.4	11° 53'.9 N	296° 30'.2	52'.9	216° 38'.6	12'.4	20'.6	4'.9	54'.5
Rigel	281° 12'.1	8° 11'.5 S	311° 30'.3	52'.1	231° 10'.0	12'.4	25'.5	4'.8	
Rigil Kent	139° 51'.7	60° 53'.1 S	326° 30'.3	51'.2	245° 41'.4	12'.3	30'.3	4'.7	
			341° 30'.4	50'.3	260° 12'.7	12'.4	35'.0	4'.6	
Sabik	102° 12'.9	15° 44'.4 S	356° 30'.4	11° 49'.4 S	274° 44'.1	12'.3	18° 39'.6 N	4'.6	54'.5
Schedar	349° 41'.1	56° 36'.8 N	11° 30'.5	48'.5	289° 15'.4	12'.3	44'.2	4'.4	
Shaula	96° 22'.4	37° 06'.6 S	26° 30'.5	47'.7	303° 46'.7	12'.3	48'.6	4'.4	
Sirius	258° 33'.6	16° 44'.4 S	41° 30'.6	46'.8	318° 18'.0	12'.3	53'.0	4'.3	54'.4
Spica	158° 31'.3	11° 13'.9 S	56° 30'.6	45'.9	332° 49'.3	12'.3	57'.3	4'.2	
			71° 30'.6	45'.0	347° 20'.6	12'.3	19° 01'.5 N	4'.1	
Suhail	222° 52'.1	43° 29'.4 S	86° 30'.7	44'.1	1° 51'.9	12'.2	05'.6	4'.0	
Vega	80° 39'.4	38° 47'.7 N	101° 30'.7	43'.3	16° 23'.1	12'.3	09'.6	3'.9	
Zuben'ubi	137° 05'.6	16° 05'.8 S	116° 30'.8	42'.4	30° 54'.4	12'.2	13'.5	3'.9	
	SHA	Mer.Pass.	131° 30'.9	41'.5	45° 25'.6	12'.2	17'.4	3'.7	
Venus	39° 49'.5	11:37	146° 30'.9	40'.6	59° 56'.8	12'.2	21'.1	3'.6	
Mars	17° 10'.8	13:06	161° 31'.0	39'.7	74° 28'.0	12'.2	24'.7	3'.6	
Jupiter	294° 57'.5	18:33							
Saturn	140° 07'.0	04:54	SD 16'.2	d 0'.9	SD	15'.1	15'.0	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 15	Moonrise 16	Moonrise 17
N 72°	06:10	07:29	08:47	07:07	06:45	-
N 70°	06:08	07:20	08:28	07:30	07:23	07:14
68°	06:07	07:12	08:13	07:47	07:49	07:55
66°	06:06	07:06	08:01	08:01	08:09	08:23
64°	06:05	07:00	07:51	08:13	08:26	08:44
62°	06:04	06:56	07:42	08:23	08:39	09:01
60°	06:03	06:51	07:35	08:31	08:51	09:16
N 58°	06:02	06:48	07:28	08:39	09:01	09:28
56°	06:01	06:44	07:23	08:45	09:10	09:39
54°	06:00	06:41	07:18	08:51	09:17	09:48
52°	05:59	06:38	07:13	08:57	09:24	09:56
50°	05:58	06:35	07:09	09:02	09:31	10:04
45°	05:55	06:29	06:59	09:12	09:44	10:20
N 40°	05:52	06:24	06:52	09:21	09:56	10:33
35°	05:49	06:19	06:45	09:29	10:05	10:45
30°	05:46	06:14	06:39	09:35	10:14	10:55
20°	05:40	06:06	06:29	09:47	10:29	11:12
N 10°	05:33	05:58	06:19	09:57	10:42	11:27
0°	05:25	05:49	06:11	10:07	10:54	11:41
S 10°	05:15	05:40	06:02	10:17	11:06	11:55
20°	05:03	05:30	05:52	10:27	11:19	12:10
30°	04:47	05:16	05:41	10:39	11:34	12:27
35°	04:37	05:08	05:35	10:46	11:43	12:38
40°	04:24	04:59	05:27	10:54	11:53	12:49
45°	04:09	04:47	05:19	11:04	12:05	13:03
S 50°	03:49	04:33	05:08	11:15	12:19	13:20
52°	03:39	04:26	05:04	11:20	12:26	13:28
54°	03:28	04:19	04:58	11:26	12:33	13:37
56°	03:15	04:10	04:52	11:33	12:42	13:46
58°	02:59	04:00	04:46	11:40	12:51	13:58
S 60°	02:40	03:49	04:38	11:48	13:02	14:11
S 62°	02:15	03:36	04:29	11:58	13:15	14:27

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 15	Moonset 16	Moonset 17
N 72°	15:43	17:01	18:21	00:25	02:24	-
N 70°	16:02	17:10	18:22	00:04	01:48	03:34
68°	16:16	17:17	18:23	-	01:23	02:54
66°	16:28	17:24	18:24	-	01:03	02:27
64°	16:38	17:29	18:25	-	00:47	02:06
62°	16:47	17:34	18:26	-	00:35	01:49
60°	16:54	17:38	18:27	-	00:24	01:35
N 58°	17:01	17:42	18:27	-	00:14	01:23
56°	17:06	17:45	18:28	-	00:06	01:13
54°	17:11	17:48	18:29	23:59	-	01:04
52°	17:16	17:51	18:30	23:52	-	00:56
50°	17:20	17:54	18:31	23:46	-	00:49
45°	17:29	18:00	18:34	23:33	-	00:33
N 40°	17:37	18:05	18:37	23:23	-	00:20
35°	17:44	18:10	18:39	23:14	-	00:09
30°	17:50	18:14	18:42	23:06	-	00:00
20°	18:00	18:22	18:48	22:52	23:44	24:34
N 10°	18:09	18:30	18:55	22:41	23:30	24:19
0°	18:17	18:39	19:03	22:30	23:16	24:04
S 10°	18:26	18:48	19:13	22:19	23:03	23:49
20°	18:36	18:58	19:25	22:07	22:49	23:33
30°	18:46	19:11	19:41	21:53	22:33	23:15
35°	18:53	19:19	19:51	21:46	22:24	23:05
40°	19:00	19:28	20:03	21:37	22:13	22:53
45°	19:08	19:40	20:18	21:27	22:01	22:38
S 50°	19:19	19:54	20:37	21:14	21:45	22:21
52°	19:23	20:00	20:47	21:09	21:38	22:13
54°	19:29	20:08	20:58	21:02	21:30	22:04
56°	19:34	20:16	21:11	20:55	21:22	21:54
58°	19:41	20:26	21:26	20:47	21:12	21:42
S 60°	19:48	20:37	21:44	20:39	21:00	21:29
S 62°	19:57	20:50	22:08	20:28	20:47	21:13

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
15	14 08	14 06	12:14	16:18	03:55	5d 28%
16	14 05	14 03	12:14	17:05	04:42	6d 37%
17	14 01	13 58	12:14	17:52	05:29	7d 47%

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2013 February 18, 19, 20 (Mon, Tue, Wed)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.4		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
18 Monday 00	148° 07'.3	185° 27'.2	15° 54'.9 S	163° 50'.2	7° 42'.2 S	82° 57'.5	20° 56'.6 N	288° 13'.9	12° 53'.4 S
01	163° 09'.8	200° 26'.6	53'.9	178° 50'.8	41'.5	97° 59'.8	56'.6	303° 16'.3	53'.4
02	178° 12'.2	215° 25'.9	53'.0	193° 51'.5	40'.7	113° 02'.1	56'.6	318° 18'.8	53'.4
03	193° 14'.7	230° 25'.3	52'.1	208° 52'.1	39'.9	128° 04'.4	56'.7	333° 21'.2	53'.4
04	208° 17'.2	245° 24'.6	51'.1	223° 52'.8	39'.2	143° 06'.7	56'.7	348° 23'.7	53'.4
05	223° 19'.6	260° 24'.0	50'.2	238° 53'.4	38'.4	158° 09'.0	56'.7	3° 26'.2	53'.4
06	238° 22'.1	275° 23'.4	49'.3	253° 54'.0	37'.6	173° 11'.3	56'.8	18° 28'.6	53'.4
07	253° 24'.6	290° 22'.7	48'.3	268° 54'.7	36'.9	188° 13'.6	56'.8	33° 31'.1	53'.3
08	268° 27'.0	305° 22'.1	47'.4	283° 55'.3	36'.1	203° 15'.9	56'.8	48° 33'.5	53'.3
09	283° 29'.5	320° 21'.5	46'.5	298° 55'.9	35'.3	218° 18'.2	56'.9	63° 36'.0	53'.3
10	298° 32'.0	335° 20'.8	45'.5	313° 56'.6	34'.5	233° 20'.5	56'.9	78° 38'.5	53'.3
11	313° 34'.4	350° 20'.2	44'.6	328° 57'.2	33'.8	248° 22'.8	57'.0	93° 40'.9	53'.3
12	328° 36'.9	5° 19'.5	15° 43'.6 S	343° 57'.8	7° 33'.0 S	263° 25'.1	20° 57'.0 N	108° 43'.4	12° 53'.3 S
13	343° 39'.4	20° 18'.9	42'.7	358° 58'.5	32'.2	278° 27'.4	57'.0	123° 45'.8	53'.3
14	358° 41'.8	35° 18'.3	41'.8	13° 59'.1	31'.5	293° 29'.7	57'.1	138° 48'.3	53'.3
15	13° 44'.3	50° 17'.6	40'.8	28° 59'.8	30'.7	308° 32'.0	57'.1	153° 50'.8	53'.3
16	28° 46'.7	65° 17'.0	39'.9	44° 00'.4	29'.9	323° 34'.3	57'.1	168° 53'.2	53'.3
17	43° 49'.2	80° 16'.4	38'.9	59° 01'.0	29'.1	338° 36'.6	57'.2	183° 55'.7	53'.3
18	58° 51'.7	95° 15'.7	38'.0	74° 01'.7	28'.4	353° 38'.9	57'.2	198° 58'.1	53'.2
19	73° 54'.1	110° 15'.1	37'.1	89° 02'.3	27'.6	8° 41'.2	57'.2	214° 00'.6	53'.2
20	88° 56'.6	125° 14'.5	36'.1	104° 03'.0	26'.8	23° 43'.5	57'.3	229° 03'.1	53'.2
21	103° 59'.1	140° 13'.8	35'.2	119° 03'.6	26'.1	38° 45'.8	57'.3	244° 05'.5	53'.2
22	119° 01'.5	155° 13'.2	34'.2	134° 04'.2	25'.3	53° 48'.1	57'.3	259° 08'.0	53'.2
23	134° 04'.0	170° 12'.6	33'.3	149° 04'.9	24'.5	68° 50'.4	57'.4	274° 10'.4	53'.2
19 Tuesday 00	149° 06'.5	185° 12'.0	15° 32'.3 S	164° 05'.5	7° 23'.7 S	83° 52'.7	20° 57'.4 N	289° 12'.9	12° 53'.2 S
01	164° 08'.9	200° 11'.3	31'.4	179° 06'.2	23'.0	98° 55'.0	57'.4	304° 15'.4	53'.2
02	179° 11'.4	215° 10'.7	30'.4	194° 06'.8	22'.2	113° 57'.3	57'.5	319° 17'.8	53'.2
03	194° 13'.9	230° 10'.1	29'.5	209° 07'.4	21'.4	128° 59'.6	57'.5	334° 20'.3	53'.2
04	209° 16'.3	245° 09'.4	28'.5	224° 08'.1	20'.7	144° 01'.9	57'.6	349° 22'.8	53'.1
05	224° 18'.8	260° 08'.8	27'.6	239° 08'.7	19'.9	159° 04'.2	57'.6	4° 25'.2	53'.1
06	239° 21'.2	275° 08'.2	26'.6	254° 09'.4	19'.1	174° 06'.5	57'.6	19° 27'.7	53'.1
07	254° 23'.7	290° 07'.6	25'.7	269° 10'.0	18'.3	189° 08'.8	57'.7	34° 30'.1	53'.1
08	269° 26'.2	305° 06'.9	24'.7	284° 10'.6	17'.6	204° 11'.1	57'.7	49° 32'.6	53'.1
09	284° 28'.6	320° 06'.3	23'.8	299° 11'.3	16'.8	219° 13'.4	57'.7	64° 35'.1	53'.1
10	299° 31'.1	335° 05'.7	22'.8	314° 11'.9	16'.0	234° 15'.7	57'.8	79° 37'.5	53'.1
11	314° 33'.6	350° 05'.1	21'.8	329° 12'.6	15'.2	249° 17'.9	57'.8	94° 40'.0	53'.1
12	329° 36'.0	5° 04'.4	15° 20'.9 S	344° 13'.2	7° 14'.5 S	264° 20'.2	20° 57'.8 N	109° 42'.5	12° 53'.1 S
13	344° 38'.5	20° 03'.8	19'.9	359° 13'.8	13'.7	279° 22'.5	57'.9	124° 44'.9	53'.1
14	359° 41'.0	35° 03'.2	19'.0	14° 14'.5	12'.9	294° 24'.8	57'.9	139° 47'.4	53'.0
15	14° 43'.4	50° 02'.6	18'.0	29° 15'.1	12'.1	309° 27'.1	58'.0	154° 49'.9	53'.0
16	29° 45'.9	65° 02'.0	17'.0	44° 15'.8	11'.4	324° 29'.4	58'.0	169° 52'.3	53'.0
17	44° 48'.3	80° 01'.3	16'.1	59° 16'.4	10'.6	339° 31'.7	58'.0	184° 54'.8	53'.0
18	59° 50'.8	95° 00'.7	15'.1	74° 17'.0	09'.8	354° 34'.0	58'.1	199° 57'.3	53'.0
19	74° 53'.3	110° 00'.1	14'.2	89° 17'.7	09'.1	9° 36'.3	58'.1	214° 59'.7	53'.0
20	89° 55'.7	124° 59'.5	13'.2	104° 18'.3	08'.3	24° 38'.6	58'.1	230° 02'.2	53'.0
21	104° 58'.2	139° 58'.9	12'.2	119° 19'.0	07'.5	39° 40'.9	58'.2	245° 04'.7	53'.0
22	120° 00'.7	154° 58'.2	11'.3	134° 19'.6	06'.7	54° 43'.1	58'.2	260° 07'.1	53'.0
23	135° 03'.1	169° 57'.6	10'.3	149° 20'.3	06'.0	69° 45'.4	58'.2	275° 09'.6	52'.9
20 Wednesday 00	150° 05'.6	184° 57'.0	15° 09'.3 S	164° 20'.9	7° 05'.2 S	84° 47'.7	20° 58'.3 N	290° 12'.0	12° 52'.9 S
01	165° 08'.1	199° 56'.4	08'.4	179° 21'.5	04'.4	99° 50'.0	58'.3	305° 14'.5	52'.9
02	180° 10'.5	214° 55'.8	07'.4	194° 22'.2	03'.6	114° 52'.3	58'.4	320° 17'.0	52'.9
03	195° 13'.0	229° 55'.2	06'.4	209° 22'.8	02'.9	129° 54'.6	58'.4	335° 19'.4	52'.9
04	210° 15'.5	244° 54'.5	05'.5	224° 23'.5	02'.1	144° 56'.9	58'.4	350° 21'.9	52'.9
05	225° 17'.9	259° 53'.9	04'.5	239° 24'.1	01'.3	159° 59'.2	58'.5	5° 24'.4	52'.9
06	240° 20'.4	274° 53'.3	03'.5	254° 24'.8	00'.5	175° 01'.4	58'.5	20° 26'.9	52'.9
07	255° 22'.8	289° 52'.7	02'.6	269° 25'.4	6° 59'.8 S	190° 03'.7	58'.5	35° 29'.3	52'.9
08	270° 25'.3	304° 52'.1	01'.6	284° 26'.0	59'.0	205° 06'.0	58'.6	50° 31'.8	52'.8
09	285° 27'.8	319° 51'.5	00'.6	299° 26'.7	58'.2	220° 08'.3	58'.6	65° 34'.3	52'.8
10	300° 30'.2	334° 50'.9	14° 59'.6 S	314° 27'.3	57'.4	235° 10'.6	58'.7	80° 36'.7	52'.8
11	315° 32'.7	349° 50'.3	58'.7	329° 28'.0	56'.7	250° 12'.9	58'.7	95° 39'.2	52'.8
12	330° 35'.2	4° 49'.6	14° 57'.7 S	344° 28'.6	6° 55'.9 S	265° 15'.1	20° 58'.7 N	110° 41'.7	12° 52'.8 S
13	345° 37'.6	19° 49'.0	56'.7	359° 29'.3	55'.1	280° 17'.4	58'.8	125° 44'.1	52'.8
14	0° 40'.1	34° 48'.4	55'.7	14° 29'.9	54'.3	295° 19'.7	58'.8	140° 46'.6	52'.8
15	15° 42'.6	49° 47'.8	54'.8	29° 30'.6	53'.5	310° 22'.0	58'.8	155° 49'.1	52'.8
16	30° 45'.0	64° 47'.2	53'.8	44° 31'.2	52'.8	325° 24'.3	58'.9	170° 51'.5	52'.8
17	45° 47'.5	79° 46'.6	52'.8	59° 31'.8	52'.0	340° 26'.6	58'.9	185° 54'.0	52'.7
18	60° 50'.0	94° 46'.0	51'.8	74° 32'.5	51'.2	355° 28'.8	59'.0	200° 56'.5	52'.7
19	75° 52'.4	109° 45'.4	50'.9	89° 33'.1	50'.4	10° 31'.1	59'.0	215° 58'.9	52'.7
20	90° 54'.9	124° 44'.8	49'.9	104° 33'.8	49'.7	25° 33'.4	59'.0	231° 01'.4	52'.7
21	105° 57'.3	139° 44'.2	48'.9	119° 34'.4	48'.9	40° 35'.7	59'.1	246° 03'.9	52'.7
22	120° 59'.8	154° 43'.6	47'.9	134° 35'.1	48'.1	55° 38'.0	59'.1	261° 06'.4	52'.7
23	136° 02'.3	169° 43'.0	46'.9	149° 35'.7	47'.3	70° 40'.2	59'.1	276° 08'.8	52'.7
	M.P. 14:01	v -0'.6	d 1'.0	v 0'.6	d 0'.8	v 2'.3	d 0'.0	v 2'.5	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.6	40° 15'.4 S
Achernar	335° 27'.3	57° 10'.5 S
Acrux	173° 08'.9	63° 10'.3 S
Adhara	255° 12'.4	28° 59'.8 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.5	55° 53'.0 N
Alkaid	152° 58'.8	49° 14'.5 N
Alnair	27° 44'.5	46° 53'.8 S
Alnilam	275° 46'.4	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.9 N
Altair	62° 08'.7	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.2 S
Antares	112° 26'.5	26° 27'.5 S
Arcturus	145° 55'.8	19° 06'.6 N
Atria	107° 28'.7	69° 02'.7 S
Avior	234° 17'.5	59° 33'.4 S
Bellatrix	278° 32'.1	6° 21'.5 N
Betelgeuse	271° 01'.3	7° 24'.3 N
Canopus	263° 55'.9	52° 42'.6 S
Capella	280° 34'.6	46° 00'.7 N
Deneb	49° 32'.0	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.3	61° 40'.5 N
Elnath	278° 12'.7	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.1 N
Enif	33° 47'.6	9° 56'.2 N
Fomalhaut	15° 24'.6	29° 33'.2 S
Gacrux	172° 00'.6	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.0 S
Hadar	148° 47'.8	60° 26'.0 S
Hamal	328° 01'.1	23° 31'.5 N
Kaus Aust.	83° 44'.3	34° 22'.5 S
Kochab	137° 19'.7	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.3	4° 08'.3 N
Menkent	148° 07'.6	36° 26'.0 S
Miaplacidus	221° 38'.8	69° 46'.5 S
Mirfak	308° 40'.7	49° 54'.6 N
Nunki	75° 58'.8	26° 16'.7 S
Peacock	53° 20'.1	56° 41'.3 S
Polaris	317° 59'.8	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.8	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.1	8° 11'.5 S
Rigil Kent	139° 51'.7	60° 53'.1 S
Sabik	102° 12'.9	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.7 N
Shaula	96° 22'.3	37° 06'.6 S
Sirius	258° 33'.7	16° 44'.4 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.4 S
Vega	80° 39'.4	38° 47'.7 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	36° 05'.5	11:40
Mars	14° 59'.1	13:03
Jupiter	294° 46'.3	18:22
Saturn	140° 06'.4	04:42

SUN	GHA	Dec
18	176° 31'.0	11° 38'.9 S
19	191° 31'.1	38'.0
20	206° 31'.1	37'.1
	SD 16'.2	d 0'.9

MOON	GHA	v	Dec	d	HP
18	88° 59'.2	12'.2	19° 28'.3 N	3'.5	54'.4
19	103° 30'.4	12'.2	31'.8	3'.4	54'.3
20	118° 01'.6	12'.1	35'.2	3'.3	
	SD 14'.8		14'.8		14'.8

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20
N 72°	05:56	07:15	08:30	-	-	-
N 70°	05:57	07:07	08:14	06:55	-	-
68°	05:57	07:01	08:01	08:08	08:37	09:34
66°	05:56	06:56	07:50	08:44	09:20	10:15
64°	05:56	06:51	07:41	09:11	09:50	10:43
62°	05:56	06:47	07:33	09:31	10:12	11:04
60°	05:55	06:44	07:27	09:48	10:30	11:22
N 58°	05:55	06:40	07:21	10:02	10:44	11:36
56°	05:54	06:37	07:16	10:14	10:57	11:49
54°	05:54	06:35	07:11	10:25	11:08	11:59
52°	05:53	06:32	07:07	10:34	11:18	12:09
50°	05:52	06:30	07:03	10:42	11:27	12:18
45°	05:50	06:25	06:55	11:00	11:46	12:36
N 40°	05:48	06:20	06:48	11:15	12:01	12:51
35°	05:46	06:16	06:41	11:27	12:14	13:03
30°	05:44	06:12	06:36	11:38	12:25	13:14
20°	05:39	06:04	06:27	11:57	12:44	13:33
N 10°	05:32	05:57	06:18	12:13	13:01	13:49
0°	05:25	05:49	06:10	12:28	13:17	14:05
S 10°	05:16	05:41	06:02	12:44	13:32	14:20
20°	05:05	05:31	05:54	13:00	13:49	14:36
30°	04:50	05:19	05:44	13:19	14:08	14:55
35°	04:40	05:11	05:38	13:30	14:20	15:06
40°	04:29	05:03	05:31	13:43	14:33	15:19
45°	04:14	04:52	05:23	13:58	14:48	15:33
S 50°	03:56	04:39	05:14	14:16	15:07	15:52
52°	03:47	04:33	05:09	14:25	15:16	16:00
54°	03:36	04:26	05:04	14:34	15:26	16:10
56°	03:24	04:18	04:59	14:45	15:37	16:20
58°	03:10	04:09	04:53	14:58	15:50	16:33
S 60°	02:53	03:58	04:46	15:13	16:05	16:47
S 62°	02:31	03:46	04:38	15:30	16:23	17:04

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 18	Moonset 19	Moonset 20
N 72°	15:59	17:15	18:34	-	-	-
N 70°	16:16	17:22	18:33	05:32	-	-
68°	16:28	17:28	18:33	04:20	05:30	06:13
66°	16:39	17:33	18:33	03:43	04:47	05:32
64°	16:48	17:38	18:33	03:17	04:18	05:04
62°	16:55	17:42	18:33	02:57	03:56	04:42
60°	17:02	17:45	18:34	02:41	03:38	04:25
N 58°	17:08	17:48	18:34	02:27	03:23	04:10
56°	17:13	17:51	18:34	02:15	03:10	03:58
54°	17:17	17:54	18:35	02:05	02:59	03:47
52°	17:22	17:56	18:36	01:55	02:49	03:37
50°	17:25	17:59	18:36	01:47	02:41	03:28
45°	17:34	18:04	18:38	01:30	02:22	03:10
N 40°	17:41	18:08	18:40	01:15	02:07	02:55
35°	17:47	18:12	18:42	01:03	01:54	02:42
30°	17:52	18:16	18:44	00:53	01:43	02:31
20°	18:01	18:24	18:49	00:34	01:24	02:12
N 10°	18:09	18:31	18:55	00:19	01:07	01:55
0°	18:17	18:38	19:03	00:04	00:52	01:40
S 10°	18:25	18:47	19:12	-	00:36	01:24
20°	18:34	18:56	19:23	-	00:19	01:07
30°	18:44	19:08	19:37	-	00:00	00:48
35°	18:49	19:16	19:47	23:49	-	00:37
40°	18:56	19:24	19:58	23:36	-	00:24
45°	19:04	19:34	20:12	23:21	-	00:09
S 50°	19:13	19:47	20:30	23:03	23:50	24:44
52°	19:17	19:54	20:39	22:54	23:41	24:36
54°	19:22	20:00	20:49	22:44	23:31	24:26
56°	19:27	20:08	21:01	22:33	23:20	24:16
58°	19:33	20:17	21:15	22:20	23:07	24:04
S 60°	19:40	20:27	21:31	22:05	22:52	23:49
S 62°	19:47	20:39	21:52	21:48	22:34	23:33

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
18	13 56	13 54	12:14	18:40	06:16	8d 56%
19	13 51	13 48	12:14	19:28	07:04	9d 65%
20	13 45	13 42	12:14	20:16	07:52	10d 74%

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2013 February 21, 22, 23 (Thur, Fri, Sat)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.4		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
21 Thursday 00	151° 04'.7	184° 42'.4	14° 45'.9 S	164° 36'.4	6° 46'.6 S	85° 42'.5	20° 59'.2 N	291° 11'.3	12° 52'.7 S
01	166° 07'.2	199° 41'.7	45'.0	179° 37'.0	45'.8	100° 44'.8	59'.2	306° 13'.8	52'.6
02	181° 09'.7	214° 41'.1	44'.0	194° 37'.7	45'.0	115° 47'.1	59'.3	321° 16'.2	52'.6
03	196° 12'.1	229° 40'.5	43'.0	209° 38'.3	44'.2	130° 49'.4	59'.3	336° 18'.7	52'.6
04	211° 14'.6	244° 39'.9	42'.0	224° 38'.9	43'.5	145° 51'.6	59'.3	351° 21'.2	52'.6
05	226° 17'.1	259° 39'.3	41'.0	239° 39'.6	42'.7	160° 53'.9	59'.4	6° 23'.7	52'.6
06	241° 19'.5	274° 38'.7	40'.0	254° 40'.2	41'.9	175° 56'.2	59'.4	21° 26'.1	52'.6
07	256° 22'.0	289° 38'.1	39'.0	269° 40'.9	41'.1	190° 58'.5	59'.4	36° 28'.6	52'.6
08	271° 24'.4	304° 37'.5	38'.1	284° 41'.5	40'.3	206° 00'.8	59'.5	51° 31'.1	52'.6
09	286° 26'.9	319° 36'.9	37'.1	299° 42'.2	39'.6	221° 03'.0	59'.5	66° 33'.5	52'.5
10	301° 29'.4	334° 36'.3	36'.1	314° 42'.8	38'.8	236° 05'.3	59'.6	81° 36'.0	52'.5
11	316° 31'.8	349° 35'.7	35'.1	329° 43'.5	38'.0	251° 07'.6	59'.6	96° 38'.5	52'.5
12	331° 34'.3	4° 35'.1	14° 34'.1 S	344° 44'.1	6° 37'.2 S	266° 09'.9	20° 59'.6 N	111° 41'.0	12° 52'.5 S
13	346° 36'.8	19° 34'.5	33'.1	359° 44'.8	36'.5	281° 12'.1	59'.7	126° 43'.4	52'.5
14	1° 39'.2	34° 33'.9	32'.1	14° 45'.4	35'.7	296° 14'.4	59'.7	141° 45'.9	52'.5
15	16° 41'.7	49° 33'.3	31'.1	29° 46'.1	34'.9	311° 16'.7	59'.8	156° 48'.4	52'.5
16	31° 44'.2	64° 32'.7	30'.1	44° 46'.7	34'.1	326° 19'.0	59'.8	171° 50'.9	52'.4
17	46° 46'.6	79° 32'.1	29'.1	59° 47'.4	33'.3	341° 21'.2	59'.8	186° 53'.3	52'.4
18	61° 49'.1	94° 31'.5	28'.1	74° 48'.0	32'.6	356° 23'.5	59'.9	201° 55'.8	52'.4
19	76° 51'.6	109° 31'.0	27'.1	89° 48'.7	31'.8	11° 25'.8	59'.9	216° 58'.3	52'.4
20	91° 54'.0	124° 30'.4	26'.1	104° 49'.3	31'.0	26° 28'.1	59'.9	232° 00'.7	52'.4
21	106° 56'.5	139° 29'.8	25'.1	119° 50'.0	30'.2	41° 30'.3	21° 00'.0 N	247° 03'.2	52'.4
22	121° 58'.9	154° 29'.2	24'.1	134° 50'.6	29'.4	56° 32'.6	00'.0	262° 05'.7	52'.4
23	137° 01'.4	169° 28'.6	23'.1	149° 51'.3	28'.7	71° 34'.9	00'.1	277° 08'.2	52'.4
22 Friday 00	152° 03'.9	184° 28'.0	14° 22'.1 S	164° 51'.9	6° 27'.9 S	86° 37'.1	21° 00'.1 N	292° 10'.6	12° 52'.3 S
01	167° 06'.3	199° 27'.4	21'.1	179° 52'.6	27'.1	101° 39'.4	00'.1	307° 13'.1	52'.3
02	182° 08'.8	214° 26'.8	20'.1	194° 53'.2	26'.3	116° 41'.7	00'.2	322° 15'.6	52'.3
03	197° 11'.3	229° 26'.2	19'.1	209° 53'.8	25'.6	131° 44'.0	00'.2	337° 18'.1	52'.3
04	212° 13'.7	244° 25'.6	18'.1	224° 54'.5	24'.8	146° 46'.2	00'.3	352° 20'.5	52'.3
05	227° 16'.2	259° 25'.0	17'.1	239° 55'.1	24'.0	161° 48'.5	00'.3	7° 23'.0	52'.3
06	242° 18'.7	274° 24'.4	16'.1	254° 55'.8	23'.2	176° 50'.8	00'.3	22° 25'.5	52'.3
07	257° 21'.1	289° 23'.8	15'.1	269° 56'.4	22'.4	191° 53'.0	00'.4	37° 28'.0	52'.2
08	272° 23'.6	304° 23'.3	14'.1	284° 57'.1	21'.7	206° 55'.3	00'.4	52° 30'.4	52'.2
09	287° 26'.1	319° 22'.7	13'.1	299° 57'.7	20'.9	221° 57'.6	00'.5	67° 32'.9	52'.2
10	302° 28'.5	334° 22'.1	12'.1	314° 58'.4	20'.1	236° 59'.8	00'.5	82° 35'.4	52'.2
11	317° 31'.0	349° 21'.5	11'.1	329° 59'.0	19'.3	252° 02'.1	00'.5	97° 37'.9	52'.2
12	332° 33'.4	4° 20'.9	14° 10'.1 S	344° 59'.7	6° 18'.5 S	267° 04'.4	21° 00'.6 N	112° 40'.4	12° 52'.2 S
13	347° 35'.9	19° 20'.3	09'.1	0° 00'.4	17'.8	282° 06'.6	00'.6	127° 42'.8	52'.2
14	2° 38'.4	34° 19'.7	08'.1	15° 01'.0	17'.0	297° 08'.9	00'.7	142° 45'.3	52'.1
15	17° 40'.8	49° 19'.1	07'.1	30° 01'.7	16'.2	312° 11'.2	00'.7	157° 47'.8	52'.1
16	32° 43'.3	64° 18'.6	06'.1	45° 02'.3	15'.4	327° 13'.4	00'.7	172° 50'.3	52'.1
17	47° 45'.8	79° 18'.0	05'.1	60° 03'.0	14'.6	342° 15'.7	00'.8	187° 52'.7	52'.1
18	62° 48'.2	94° 17'.4	04'.0	75° 03'.6	13'.9	357° 18'.0	00'.8	202° 55'.2	52'.1
19	77° 50'.7	109° 16'.8	03'.0	90° 04'.3	13'.1	12° 20'.2	00'.9	217° 57'.7	52'.1
20	92° 53'.2	124° 16'.2	02'.0	105° 04'.9	12'.3	27° 22'.5	00'.9	233° 00'.2	52'.1
21	107° 55'.6	139° 15'.6	01'.0	120° 05'.6	11'.5	42° 24'.8	00'.9	248° 02'.7	52'.0
22	122° 58'.1	154° 15'.1	00'.0	135° 06'.2	10'.7	57° 27'.0	01'.0	263° 05'.1	52'.0
23	138° 00'.6	169° 14'.5	13° 59'.0 S	150° 06'.9	10'.0	72° 29'.3	01'.0	278° 07'.6	52'.0
23 Saturday 00	153° 03'.0	184° 13'.9	13° 58'.0 S	165° 07'.5	6° 09'.2 S	87° 31'.6	21° 01'.1 N	293° 10'.1	12° 52'.0 S
01	168° 05'.5	199° 13'.3	56'.9	180° 08'.2	08'.4	102° 33'.8	01'.1	308° 12'.6	52'.0
02	183° 07'.9	214° 12'.7	55'.9	195° 08'.8	07'.6	117° 36'.1	01'.1	323° 15'.1	52'.0
03	198° 10'.4	229° 12'.1	54'.9	210° 09'.5	06'.8	132° 38'.4	01'.2	338° 17'.5	52'.0
04	213° 12'.9	244° 11'.6	53'.9	225° 10'.1	06'.0	147° 40'.6	01'.2	353° 20'.0	51'.9
05	228° 15'.3	259° 11'.0	52'.9	240° 10'.8	05'.3	162° 42'.9	01'.3	8° 22'.5	51'.9
06	243° 17'.8	274° 10'.4	51'.8	255° 11'.4	04'.5	177° 45'.1	01'.3	23° 25'.0	51'.9
07	258° 20'.3	289° 09'.8	50'.8	270° 12'.1	03'.7	192° 47'.4	01'.3	38° 27'.5	51'.9
08	273° 22'.7	304° 09'.3	49'.8	285° 12'.7	02'.9	207° 49'.7	01'.4	53° 29'.9	51'.9
09	288° 25'.2	319° 08'.7	48'.8	300° 13'.4	02'.1	222° 51'.9	01'.4	68° 32'.4	51'.9
10	303° 27'.7	334° 08'.1	47'.8	315° 14'.0	01'.4	237° 54'.2	01'.5	83° 34'.9	51'.8
11	318° 30'.1	349° 07'.5	46'.7	330° 14'.7	00'.6	252° 56'.5	01'.5	98° 37'.4	51'.8
12	333° 32'.6	4° 07'.0	13° 45'.7 S	345° 15'.3	5° 59'.8 S	267° 58'.7	21° 01'.5 N	113° 39'.9	12° 51'.8 S
13	348° 35'.0	19° 06'.4	44'.7	0° 16'.0	59'.0	283° 01'.0	01'.6	128° 42'.3	51'.8
14	3° 37'.5	34° 05'.8	43'.7	15° 16'.7	58'.2	298° 03'.2	01'.6	143° 44'.8	51'.8
15	18° 40'.0	49° 05'.2	42'.6	30° 17'.3	57'.4	313° 05'.5	01'.7	158° 47'.3	51'.8
16	33° 42'.4	64° 04'.7	41'.6	45° 18'.0	56'.7	328° 07'.7	01'.7	173° 49'.8	51'.8
17	48° 44'.9	79° 04'.1	40'.6	60° 18'.6	55'.9	343° 10'.0	01'.7	188° 52'.3	51'.7
18	63° 47'.4	94° 03'.5	39'.6	75° 19'.3	55'.1	358° 12'.3	01'.8	203° 54'.7	51'.7
19	78° 49'.8	109° 02'.9	38'.5	90° 19'.9	54'.3	13° 14'.5	01'.8	218° 57'.2	51'.7
20	93° 52'.3	124° 02'.4	37'.5	105° 20'.6	53'.5	28° 16'.8	01'.9	233° 59'.7	51'.7
21	108° 54'.8	139° 01'.8	36'.5	120° 21'.2	52'.8	43° 19'.0	01'.9	249° 02'.2	51'.7
22	123° 57'.2	154° 01'.2	35'.4	135° 21'.9	52'.0	58° 21'.3	01'.9	264° 04'.7	51'.7
23	138° 59'.7	169° 00'.6	34'.4	150° 22'.5	51'.2	73° 23'.6	02'.0	279° 07'.2	51'.6
	M.P. 13:49	v -0'.6	d 1'.0	v 0'.7	d 0'.8	v 2'.3	d 0'.0	v 2'.5	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.6	40° 15'.4 S
Achernar	335° 27'.3	57° 10'.5 S
Acrux	173° 08'.9	63° 10'.3 S
Adhara	255° 12'.4	28° 59'.8 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.5	55° 53'.0 N
Alkaid	152° 58'.8	49° 14'.5 N
Alnair	27° 44'.4	46° 53'.8 S
Alnilam	275° 46'.4	1° 11'.9 S
Alphard	217° 55'.9	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.7	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.2 S
Antares	112° 26'.5	26° 27'.5 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.6	69° 02'.7 S
Avior	234° 17'.5	59° 33'.4 S
Bellatrix	278° 32'.1	6° 21'.5 N
Betelgeuse	271° 01'.4	7° 24'.3 N
Canopus	263° 55'.9	52° 42'.6 S
Capella	280° 34'.6	46° 00'.7 N
Deneb	49° 32'.0	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.7 N
Diphda	348° 56'.3	17° 55'.0 S
Dubhe	193° 51'.3	61° 40'.5 N
Elnath	278° 12'.7	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.1 N
Enif	33° 47'.6	9° 56'.2 N
Fomalhaut	15° 24'.6	29° 33'.2 S
Gacrux	172° 00'.6	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.0 S
Hadar	148° 47'.8	60° 26'.0 S
Hamal	328° 01'.1	23° 31'.5 N
Kaus Aust.	83° 44'.3	34° 22'.5 S
Kochab	137° 19'.7	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.3	4° 08'.3 N
Menkent	148° 07'.6	36° 26'.0 S
Miaplacidus	221° 38'.8	69° 46'.5 S
Mirfak	308° 40'.7	49° 54'.6 N
Nunki	75° 58'.8	26° 16'.7 S
Peacock	53° 20'.1	56° 41'.3 S
Polaris	318° 01'.1	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.7	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.1	8° 11'.5 S
Rigil Kent	139° 51'.7	60° 53'.1 S
Sabik	102° 12'.8	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.7 N
Shaula	96° 22'.3	37° 06'.6 S
Sirius	258° 33'.7	16° 44'.4 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.4 S
Vega	80° 39'.3	38° 47'.6 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	32° 24'.1	11:43
Mars	12° 48'.0	13:00
Jupiter	294° 33'.3	18:11
Saturn	140° 06'.8	04:31

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
176° 35'.5	10° 34'.5 S	54° 05'.8	11'.9	19° 38'.5 N	3'.3	54'.5
191° 35'.6	33'.6	68° 36'.7	11'.9	35'.2	3'.4	
206° 35'.7	32'.7	83° 07'.6	11'.9	31'.8	3'.5	
221° 35'.7	31'.8	97° 38'.5	11'.9	28'.3	3'.6	
236° 35'.8	30'.9	112° 09'.4	11'.9	24'.7	3'.7	
251° 35'.9	30'.0	126° 40'.3	12'.0	21'.0	3'.8	
266° 36'.0	29'.1	141° 11'.3	11'.9	17'.2	3'.9	
281° 36'.0	28'.2	155° 42'.2	11'.9	13'.3	3'.9	
296° 36'.1	27'.3	170° 13'.1	12'.0	09'.4	4'.1	54'.6
311° 36'.2	26'.4	184° 44'.1	11'.9	05'.3	4'.1	
326° 36'.3	25'.5	199° 15'.0	12'.0	01'.2	4'.3	
341° 36'.3	24'.6	213° 46'.0	11'.9	18° 56'.9 N	4'.3	
356° 36'.4	10° 23'.7 S	228° 16'.9	12'.0	18° 52'.6 N	4'.4	54'.6
11° 36'.5	22'.8	242° 47'.9	12'.0	48'.2	4'.5	
26° 36'.6	21'.9	257° 18'.9	12'.0	43'.7	4'.6	
41° 36'.6	20'.9	271° 49'.9	12'.0	39'.1	4'.7	54'.7
56° 36'.7	20'.0	286° 20'.9	12'.0	34'.4	4'.8	
71° 36'.8	19'.1	300° 51'.9	12'.0	29'.6	4'.8	
86° 36'.9	18'.2	315° 22'.9	12'.0	24'.8	5'.0	
101° 37'.0	17'.3	329° 53'.9	12'.1	19'.8	5'.0	
116° 37'.0	16'.4	344° 25'.0	12'.0	14'.8	5'.2	
131° 37'.1	15'.5	358° 56'.0	12'.1	09'.6	5'.2	
146° 37'.2	14'.6	13° 27'.1	12'.0	04'.4	5'.3	54'.8
161° 37'.3	13'.7	27° 58'.1	12'.1	17° 59'.1 N	5'.4	
176° 37'.3	10° 12'.8 S	42° 29'.2	12'.1	17° 53'.7 N	5'.5	54'.8
191° 37'.4	11'.9	57° 00'.3	12'.1	48'.2	5'.6	
206° 37'.5	10'.9	71° 31'.4	12'.1	42'.6	5'.6	
221° 37'.6	10'.0	86° 02'.5	12'.1	37'.0	5'.8	
236° 37'.7	09'.1	100° 33'.6	12'.2	31'.2	5'.8	54'.9
251° 37'.7	08'.2	115° 04'.8	12'.1	25'.4	5'.9	
266° 37'.8	07'.3	129° 35'.9	12'.1	19'.5	6'.0	
281° 37'.9	06'.4	144° 07'.0	12'.2	13'.5	6'.1	
296° 38'.0	05'.5	158° 38'.2	12'.2	07'.4	6'.2	
311° 38'.1	04'.6	173° 09'.4	12'.2	01'.2	6'.2	55'.0
326° 38'.2	03'.6	187° 40'.6	12'.2	16° 55'.0 N	6'.4	
341° 38'.2	02'.7	202° 11'.8	12'.2	48'.6	6'.4	
356° 38'.3	10° 01'.8 S	216° 43'.0	12'.2	16° 42'.2 N	6'.5	55'.0
11° 38'.4	00'.9	231° 14'.2	12'.2	35'.7	6'.6	
26° 38'.5	10° 00'.0 S	245° 45'.4	12'.2	29'.1	6'.6	
41° 38'.6	59'.1	260° 16'.6	12'.3	22'.5	6'.8	55'.1
56° 38'.7	58'.2	274° 47'.9	12'.2	15'.7	6'.8	
71° 38'.7	57'.2	289° 19'.1	12'.3	08'.9	6'.9	
86° 38'.8	56'.3	303° 50'.4	12'.3	02'.0	7'.0	
101° 38'.9	55'.4	318° 21'.7	12'.3	15° 55'.0 N	7'.1	
116° 39'.0	54'.5	332° 53'.0	12'.3	47'.9	7'.1	55'.2
131° 39'.1	53'.6	347° 24'.3	12'.3	40'.8	7'.3	
146° 39'.2	52'.7	1° 55'.6	12'.3	33'.5	7'.3	
161° 39'.3	51'.8	16° 26'.9	12'.4	26'.2	7'.4	
176° 39'.3	9° 50'.8 S	30° 58'.3	12'.3	15° 18'.8 N	7'.4	55'.2
191° 39'.4	49'.9	45° 29'.6	12'.4	11'.4	7'.6	55'.3
206° 39'.5	49'.0	60° 01'.0	12'.4	03'.8	7'.6	
221° 39'.6	48'.1	74° 32'.4	12'.3	14° 56'.2 N	7'.7	
236° 39'.7	47'.2	89° 03'.7	12'.4	48'.5	7'.8	
251° 39'.8	46'.2	103° 35'.1	12'.4	40'.7	7'.8	
266° 39'.9	45'.3	118° 06'.5	12'.4	32'.9	7'.9	55'.4
281° 40'.0	44'.4	132° 37'.9	12'.5	25'.0	8'.0	
296° 40'.0	43'.5	147° 09'.4	12'.4	17'.0	8'.1	
311° 40'.1	42'.6	161° 40'.8	12'.4	08'.9	8'.1	
326° 40'.2	41'.7	176° 12'.2	12'.5	00'.8	8'.2	55'.5
341° 40'.3	40'.7	190° 43'.7	12'.5	13° 52'.6 N	8'.3	
356° 40'.4	9° 39'.8 S	205° 15'.2	12'.4	13° 44'.3 N	8'.4	55'.5
11° 40'.5	38'.9	219° 46'.6	12'.5	35'.9	8'.4	
26° 40'.6	38'.0	234° 18'.1	12'.5	27'.5	8'.5	
41° 40'.7	37'.1	248° 49'.6	12'.5	19'.0	8'.6	55'.6
56° 40'.8	36'.1	263° 21'.1	12'.5	10'.4	8'.6	
71° 40'.8	35'.2	277° 52'.6	12'.5	01'.8	8'.7	
86° 40'.9	34'.3	292° 24'.1	12'.6	12° 53'.1 N	8'.8	
101° 41'.0	33'.4	306° 55'.7	12'.5	44'.3	8'.8	55'.7
116° 41'.1	32'.4	321° 27'.2	12'.6	35'.5	8'.9	
131° 41'.2	31'.5	335° 58'.8	12'.5	26'.6	9'.0	
146° 41'.3	30'.6	350° 30'.3	12'.6	17'.6	9'.0	
161° 41'.4	29'.7	5° 01'.9	12'.5	08'.6	9'.1	
SD 16'.2	d 0'.9	SD	14'.9	15'.0	15'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23
N 72°	05:43	07:01	08:13	-	11:01	13:11
N 70°	05:44	06:55	07:59	10:02	11:53	13:39
68°	05:46	06:50	07:48	10:54	12:24	13:59
66°	05:46	06:46	07:39	11:26	12:48	14:15
64°	05:47	06:42	07:31	11:50	13:06	14:28
62°	05:47	06:39	07:24	12:08	13:21	14:39
60°	05:48	06:36	07:18	12:24	13:33	14:48
N 58°	05:48	06:33	07:13	12:37	13:44	14:56
56°	05:48	06:31	07:08	12:48	13:53	15:04
54°	05:47	06:28	07:04	12:58	14:02	15:10
52°	05:47	06:26	07:01	13:06	14:09	15:16
50°	05:47	06:24	06:57	13:14	14:16	15:21
45°	05:46	06:20	06:50	13:31	14:30	15:32
N 40°	05:45	06:16	06:43	13:45	14:42	15:41
35°	05:43	06:12	06:38	13:56	14:52	15:49
30°	05:41	06:09	06:33	14:06	15:00	15:56
20°	05:37	06:02	06:25	14:24	15:15	16:08
N 10°	05:31	05:56	06:17	14:39	15:28	16:18
0°	05:25	05:49	06:10	14:53	15:41	16:28
S 10°	05:17	05:41	06:03	15:07	15:53	16:38
20°	05:06	05:32	05:55	15:22	16:06	16:48
30°	04:52	05:21	05:46	15:39	16:21	17:00
35°	04:43	05:14	05:41	15:49	16:29	17:06
40°	04:33	05:06	05:35	16:01	16:39	17:14
45°	04:19	04:57	05:27	16:14	16:50	17:23
S 50°	04:02	04:45	05:19	16:30	17:04	17:34
52°	03:54	04:39	05:15	16:38	17:11	17:39
54°	03:44	04:32	05:11	16:47	17:18	17:44
56°	03:33	04:25	05:06	16:56	17:26	17:50
58°	03:20	04:17	05:00	17:07	17:35	17:57
S 60°	03:05	04:07	04:54	17:20	17:45	18:05
S 62°	02:46	03:56	04:47	17:34	17:57	18:14

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 21	Moonset 22	Moonset 23
N 72°	16:15	17:28	18:47	-	08:07	07:36
N 70°	16:29	17:34	18:45	07:26	07:15	07:07
68°	16:40	17:39	18:43	06:33	06:42	06:46
66°	16:50	17:43	18:42	06:01	06:18	06:29
64°	16:57	17:46	18:42	05:37	05:59	06:15
62°	17:04	17:50	18:41	05:18	05:44	06:03
60°	17:10	17:52	18:41	05:02	05:31	05:53
N 58°	17:15	17:55	18:41	04:49	05:20	05:45
56°	17:19	17:57	18:41	04:37	05:10	05:37
54°	17:23	18:00	18:41	04:27	05:01	05:30
52°	17:27	18:02	18:41	04:18	04:54	05:24
50°	17:31	18:03	18:41	04:10	04:47	05:18
45°	17:38	18:08	18:42	03:53	04:32	05:06
N 40°	17:44	18:11	18:43	03:39	04:19	04:56
35°	17:49	18:15	18:44	03:27	04:09	04:47
30°	17:54	18:18	18:46	03:17	03:59	04:39
20°	18:02	18:25	18:50	02:59	03:43	04:26
N 10°	18:10	18:31	18:56	02:43	03:29	04:14
0°	18:17	18:38	19:02	02:28	03:16	04:03
S 10°	18:24	18:45	19:10	02:13	03:03	03:52
20°	18:32	18:54	19:20	01:57	02:48	03:41
30°	18:41	19:05	19:34	01:39	02:32	03:27
35°	18:46	19:12	19:43	01:28	02:23	03:19
40°	18:52	19:20	19:53	01:16	02:12	03:10
45°	18:59	19:29	20:06	01:02	01:59	02:59
S 50°	19:07	19:41	20:23	00:44	01:43	02:46
52°	19:11	19:47	20:31	00:36	01:36	02:40
54°	19:15	19:53	20:41	00:26	01:27	02:34
56°	19:20	20:00	20:51	00:16	01:18	02:26
58°	19:25	20:08	21:04	00:04	01:08	02:18
S 60°	19:31	20:17	21:19	-	00:56	02:08
S 62°	19:38	20:28	21:37	-	00:41	01:57

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
21	13 38	13 35	12:14	21:04	08:40	11d 82%
22	13 31	13 27	12:13	21:52	09:28	12d 89%
23	13 23	13 19	12:13	22:39	10:16	13d 94%

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2013 February 24, 25, 26 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.3		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
24 Sunday 00	154° 02'.2	184° 00'.1	13° 33'.4 S	165° 23'.2	5° 50'.4 S	88° 25'.8	21° 02'.0 N	294° 09'.6	12° 51'.6 S
01	169° 04'.6	198° 59'.5	32'.3	180° 23'.8	49'.6	103° 28'.1	02'.1	309° 12'.1	51'.6
02	184° 07'.1	213° 58'.9	31'.3	195° 24'.5	48'.8	118° 30'.3	02'.1	324° 14'.6	51'.6
03	199° 09'.5	228° 58'.4	30'.3	210° 25'.2	48'.1	133° 32'.6	02'.2	339° 17'.1	51'.6
04	214° 12'.0	243° 57'.8	29'.2	225° 25'.8	47'.3	148° 34'.8	02'.2	354° 19'.6	51'.6
05	229° 14'.5	258° 57'.2	28'.2	240° 26'.5	46'.5	163° 37'.1	02'.2	9° 22'.1	51'.5
06	244° 16'.9	273° 56'.7	27'.2	255° 27'.1	45'.7	178° 39'.3	02'.3	24° 24'.5	51'.5
07	259° 19'.4	288° 56'.1	26'.1	270° 27'.8	44'.9	193° 41'.6	02'.3	39° 27'.0	51'.5
08	274° 21'.9	303° 55'.5	25'.1	285° 28'.4	44'.1	208° 43'.8	02'.4	54° 29'.5	51'.5
09	289° 24'.3	318° 55'.0	24'.1	300° 29'.1	43'.4	223° 46'.1	02'.4	69° 32'.0	51'.5
10	304° 26'.8	333° 54'.4	23'.0	315° 29'.7	42'.6	238° 48'.3	02'.4	84° 34'.5	51'.5
11	319° 29'.3	348° 53'.8	22'.0	330° 30'.4	41'.8	253° 50'.6	02'.5	99° 37'.0	51'.4
12	334° 31'.7	3° 53'.3	13° 21'.0 S	345° 31'.1	5° 41'.0 S	268° 52'.9	21° 02'.5 N	114° 39'.5	12° 51'.4 S
13	349° 34'.2	18° 52'.7	19'.9	0° 31'.7	40'.2	283° 55'.1	02'.6	129° 41'.9	51'.4
14	4° 36'.6	33° 52'.1	18'.9	15° 32'.4	39'.4	298° 57'.4	02'.6	144° 44'.4	51'.4
15	19° 39'.1	48° 51'.6	17'.8	30° 33'.0	38'.7	313° 59'.6	02'.7	159° 46'.9	51'.4
16	34° 41'.6	63° 51'.0	16'.8	45° 33'.7	37'.9	329° 01'.9	02'.7	174° 49'.4	51'.4
17	49° 44'.0	78° 50'.5	15'.8	60° 34'.3	37'.1	344° 04'.1	02'.7	189° 51'.9	51'.3
18	64° 46'.5	93° 49'.9	14'.7	75° 35'.0	36'.3	359° 06'.4	02'.8	204° 54'.4	51'.3
19	79° 49'.0	108° 49'.3	13'.7	90° 35'.7	35'.5	14° 08'.6	02'.8	219° 56'.9	51'.3
20	94° 51'.4	123° 48'.8	12'.6	105° 36'.3	34'.7	29° 10'.9	02'.9	234° 59'.3	51'.3
21	109° 53'.9	138° 48'.2	11'.6	120° 37'.0	34'.0	44° 13'.1	02'.9	250° 01'.8	51'.3
22	124° 56'.4	153° 47'.7	10'.5	135° 37'.6	33'.2	59° 15'.4	02'.9	265° 04'.3	51'.3
23	139° 58'.8	168° 47'.1	09'.5	150° 38'.3	32'.4	74° 17'.6	03'.0	280° 06'.8	51'.2
25 Monday 00	155° 01'.3	183° 46'.5	13° 08'.4 S	165° 38'.9	5° 31'.6 S	89° 19'.9	21° 03'.0 N	295° 09'.3	12° 51'.2 S
01	170° 03'.8	198° 46'.0	07'.4	180° 39'.6	30'.8	104° 22'.1	03'.1	310° 11'.8	51'.2
02	185° 06'.2	213° 45'.4	06'.3	195° 40'.3	30'.0	119° 24'.4	03'.1	325° 14'.3	51'.2
03	200° 08'.7	228° 44'.9	05'.3	210° 40'.9	29'.2	134° 26'.6	03'.2	340° 16'.8	51'.2
04	215° 11'.1	243° 44'.3	04'.2	225° 41'.6	28'.5	149° 28'.8	03'.2	355° 19'.2	51'.1
05	230° 13'.6	258° 43'.8	03'.2	240° 42'.2	27'.7	164° 31'.1	03'.2	10° 21'.7	51'.1
06	245° 16'.1	273° 43'.2	02'.1	255° 42'.9	26'.9	179° 33'.3	03'.3	25° 24'.2	51'.1
07	260° 18'.5	288° 42'.6	01'.1	270° 43'.5	26'.1	194° 35'.6	03'.3	40° 26'.7	51'.1
08	275° 21'.0	303° 42'.1	00'.0	285° 44'.2	25'.3	209° 37'.8	03'.4	55° 29'.2	51'.1
09	290° 23'.5	318° 41'.5	12° 59'.0 S	300° 44'.9	24'.5	224° 40'.1	03'.4	70° 31'.7	51'.1
10	305° 25'.9	333° 41'.0	57'.9	315° 45'.5	23'.8	239° 42'.3	03'.5	85° 34'.2	51'.0
11	320° 28'.4	348° 40'.4	56'.9	330° 46'.2	23'.0	254° 44'.6	03'.5	100° 36'.7	51'.0
12	335° 30'.9	3° 39'.9	12° 55'.8 S	345° 46'.8	5° 22'.2 S	269° 46'.8	21° 03'.5 N	115° 39'.2	12° 51'.0 S
13	350° 33'.3	18° 39'.3	54'.8	0° 47'.5	21'.4	284° 49'.1	03'.6	130° 41'.6	51'.0
14	5° 35'.8	33° 38'.8	53'.7	15° 48'.2	20'.6	299° 51'.3	03'.6	145° 44'.1	51'.0
15	20° 38'.3	48° 38'.2	52'.7	30° 48'.8	19'.8	314° 53'.5	03'.7	160° 46'.6	51'.0
16	35° 40'.7	63° 37'.7	51'.6	45° 49'.5	19'.0	329° 55'.8	03'.7	175° 49'.1	50'.9
17	50° 43'.2	78° 37'.1	50'.6	60° 50'.1	18'.3	344° 58'.0	03'.8	190° 51'.6	50'.9
18	65° 45'.6	93° 36'.6	49'.5	75° 50'.8	17'.5	0° 00'.3	03'.8	205° 54'.1	50'.9
19	80° 48'.1	108° 36'.0	48'.4	90° 51'.5	16'.7	15° 02'.5	03'.8	220° 56'.6	50'.9
20	95° 50'.6	123° 35'.5	47'.4	105° 52'.1	15'.9	30° 04'.8	03'.9	235° 59'.1	50'.9
21	110° 53'.0	138° 34'.9	46'.3	120° 52'.8	15'.1	45° 07'.0	03'.9	251° 01'.6	50'.8
22	125° 55'.5	153° 34'.4	45'.3	135° 53'.4	14'.3	60° 09'.2	04'.0	266° 04'.1	50'.8
23	140° 58'.0	168° 33'.8	44'.2	150° 54'.1	13'.5	75° 11'.5	04'.0	281° 06'.6	50'.8
26 Tuesday 00	156° 00'.4	183° 33'.3	12° 43'.1 S	165° 54'.8	5° 12'.8 S	90° 13'.7	21° 04'.1 N	296° 09'.0	12° 50'.8 S
01	171° 02'.9	198° 32'.7	42'.1	180° 55'.4	12'.0	105° 16'.0	04'.1	311° 11'.5	50'.8
02	186° 05'.4	213° 32'.2	41'.0	195° 56'.1	11'.2	120° 18'.2	04'.1	326° 14'.0	50'.7
03	201° 07'.8	228° 31'.6	40'.0	210° 56'.7	10'.4	135° 20'.4	04'.2	341° 16'.5	50'.7
04	216° 10'.3	243° 31'.1	38'.9	225° 57'.4	09'.6	150° 22'.7	04'.2	356° 19'.0	50'.7
05	231° 12'.7	258° 30'.5	37'.8	240° 58'.1	08'.8	165° 24'.9	04'.3	11° 21'.5	50'.7
06	246° 15'.2	273° 30'.0	36'.8	255° 58'.7	08'.0	180° 27'.2	04'.3	26° 24'.0	50'.7
07	261° 17'.7	288° 29'.4	35'.7	270° 59'.4	07'.3	195° 29'.4	04'.4	41° 26'.5	50'.7
08	276° 20'.1	303° 28'.9	34'.6	286° 00'.0	06'.5	210° 31'.6	04'.4	56° 29'.0	50'.6
09	291° 22'.6	318° 28'.4	33'.6	301° 00'.7	05'.7	225° 33'.9	04'.5	71° 31'.5	50'.6
10	306° 25'.1	333° 27'.8	32'.5	316° 01'.4	04'.9	240° 36'.1	04'.5	86° 34'.0	50'.6
11	321° 27'.5	348° 27'.3	31'.4	331° 02'.0	04'.1	255° 38'.3	04'.5	101° 36'.5	50'.6
12	336° 30'.0	3° 26'.7	12° 30'.4 S	346° 02'.7	5° 03'.3 S	270° 40'.6	21° 04'.6 N	116° 39'.0	12° 50'.6 S
13	351° 32'.5	18° 26'.2	29'.3	1° 03'.4	02'.5	285° 42'.8	04'.6	131° 41'.5	50'.5
14	6° 34'.9	33° 25'.6	28'.2	16° 04'.0	01'.7	300° 45'.1	04'.7	146° 43'.9	50'.5
15	21° 37'.4	48° 25'.1	27'.2	31° 04'.7	01'.0	315° 47'.3	04'.7	161° 46'.4	50'.5
16	36° 39'.9	63° 24'.6	26'.1	46° 05'.3	00'.2	330° 49'.5	04'.8	176° 48'.9	50'.5
17	51° 42'.3	78° 24'.0	25'.0	61° 06'.0	4° 59'.4 S	345° 51'.8	04'.8	191° 51'.4	50'.5
18	66° 44'.8	93° 23'.5	23'.9	76° 06'.7	58'.6	0° 54'.0	04'.8	206° 53'.9	50'.4
19	81° 47'.2	108° 22'.9	22'.9	91° 07'.3	57'.8	15° 56'.2	04'.9	221° 56'.4	50'.4
20	96° 49'.7	123° 22'.4	21'.8	106° 08'.0	57'.0	30° 58'.5	04'.9	236° 58'.9	50'.4
21	111° 52'.2	138° 21'.9	20'.7	121° 08'.6	56'.2	46° 00'.7	05'.0	252° 01'.4	50'.4
22	126° 54'.6	153° 21'.3	19'.6	136° 09'.3	55'.4	61° 02'.9	05'.0	267° 03'.9	50'.4
23	141° 57'.1	168° 20'.8	18'.6	151° 10'.0	54'.7	76° 05'.2	05'.1	282° 06'.4	50'.3
	M.P. 13:38	v -0'.6	d 1'.1	v 0'.7	d 0'.8	v 2'.2	d 0'.0	v 2'.5	d 0'.0

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 18'.6	40° 15'.4 S	176° 41'.5	9° 28'.8 S	19° 33'.4	12'.6	11° 59'.5 N	9'.2	55'.8
Achernar	335° 27'.3	57° 10'.4 S	191° 41'.6	27'.8	34° 05'.0	12'.6	50'.3	9'.2	
Acrux	173° 08'.9	63° 10'.3 S	206° 41'.7	26'.9	48° 36'.6	12'.6	41'.1	9'.3	
Adhara	255° 12'.4	28° 59'.8 S	221° 41'.8	26'.0	63° 08'.2	12'.6	31'.8	9'.3	
Aldebaran	290° 49'.6	16° 32'.0 N	236° 41'.9	25'.1	77° 39'.8	12'.6	22'.5	9'.5	55'.9
			251° 42'.0	24'.1	92° 11'.4	12'.6	13'.0	9'.4	
Alioth	166° 20'.4	55° 53'.0 N	266° 42'.1	23'.2	106° 43'.0	12'.6	03'.6	9'.6	
Alkaid	152° 58'.8	49° 14'.6 N	281° 42'.1	22'.3	121° 14'.6	12'.6	10° 54'.0 N	9'.6	
Alnair	27° 44'.4	46° 53'.8 S	296° 42'.2	21'.4	135° 46'.2	12'.6	44'.4	9'.6	56'.0
Alnilam	275° 46'.4	1° 11'.9 S	311° 42'.3	20'.4	150° 17'.8	12'.7	34'.8	9'.7	
Alphard	217° 56'.0	8° 43'.2 S	326° 42'.4	19'.5	164° 49'.5	12'.6	25'.1	9'.8	
			341° 42'.5	18'.6	179° 21'.1	12'.7	15'.3	9'.8	
Alphecca	126° 11'.1	26° 40'.0 N	356° 42'.6	9° 17'.7 S	193° 52'.8	12'.6	10° 05'.5 N	9'.9	56'.1
Alpheratz	357° 44'.0	29° 09'.8 N	11° 42'.7	16'.7	208° 24'.4	12'.6	9° 55'.6 N	10'.0	
Altair	62° 08'.7	8° 54'.2 N	26° 42'.8	15'.8	222° 56'.0	12'.7	45'.6	9'.9	
Ankaa	353° 16'.3	42° 14'.2 S	41° 42'.9	14'.9	237° 27'.7	12'.6	35'.7	10'.1	
Antares	112° 26'.5	26° 27'.5 S	56° 43'.0	14'.0	251° 59'.3	12'.7	25'.6	10'.1	
			71° 43'.1	13'.0	266° 31'.0	12'.6	15'.5	10'.1	56'.2
Arcturus	145° 55'.7	19° 06'.6 N	86° 43'.2	12'.1	281° 02'.6	12'.7	05'.4	10'.2	
Atria	107° 28'.6	69° 02'.7 S	101° 43'.3	11'.2	295° 34'.3	12'.7	8° 55'.2 N	10'.3	
Avior	234° 17'.5	59° 33'.5 S	116° 43'.4	10'.3	310° 06'.0	12'.6	44'.9	10'.3	
Bellatrix	278° 32'.1	6° 21'.5 N	131° 43'.5	09'.3	324° 37'.6	12'.7	34'.6	10'.4	56'.3
Betelgeuse	271° 01'.4	7° 24'.3 N	146° 43'.6	08'.4	339° 09'.3	12'.6	24'.2	10'.4	
			161° 43'.7	07'.5	353° 40'.9	12'.7	13'.8	10'.4	
Canopus	263° 56'.0	52° 42'.6 S	176° 43'.8	9° 06'.5 S	8° 12'.6	12'.7	8° 03'.4 N	10'.5	56'.3
Capella	280° 34'.6	46° 00'.7 N	191° 43'.9	05'.6	22° 44'.3	12'.6	7° 52'.9 N	10'.6	56'.4
Deneb	49° 32'.0	45° 19'.6 N	206° 44'.0	04'.7	37° 15'.9	12'.7	42'.3	10'.5	
Denebola	182° 33'.5	14° 29'.7 N	221° 44'.1	03'.7	51° 47'.6	12'.6	31'.8	10'.7	
Diphda	348° 56'.3	17° 55'.0 S	236° 44'.2	02'.8	66° 19'.2	12'.7	21'.1	10'.7	
			251° 44'.3	01'.9	80° 50'.9	12'.6	10'.4	10'.7	56'.5
Dubhe	193° 51'.3	61° 40'.6 N	266° 44'.4	01'.0	95° 22'.5	12'.7	6° 59'.7 N	10'.7	
Elnath	278° 12'.7	28° 37'.0 N	281° 44'.5	00'.0	109° 54'.2	12'.6	49'.0	10'.8	
Eltanin	90° 46'.4	51° 29'.0 N	296° 44'.6	8° 59'.1 S	124° 25'.8	12'.7	38'.2	10'.9	
Enif	33° 47'.6	9° 56'.1 N	311° 44'.7	58'.2	138° 57'.5	12'.6	27'.3	10'.9	56'.6
Fomalhaut	15° 24'.6	29° 33'.2 S	326° 44'.8	57'.2	153° 29'.1	12'.6	16'.4	10'.9	
			341° 44'.9	56'.3	168° 00'.7	12'.6	05'.5	11'.0	
Gacrux	172° 00'.6	57° 11'.2 S	356° 45'.0	8° 55'.4 S	182° 32'.3	12'.7	5° 54'.5 N	11'.0	56'.6
Gienah	175° 52'.2	17° 37'.1 S	11° 45'.1	54'.4	197° 04'.0	12'.6	43'.5	11'.0	56'.7
Hadar	148° 47'.8	60° 26'.0 S	26° 45'.2	53'.5	211° 35'.6	12'.6	32'.5	11'.1	
Hamal	328° 01'.1	23° 31'.5 N	41° 45'.3	52'.6	226° 07'.2	12'.6	21'.4	11'.1	
Kaus Aust.	83° 44'.3	34° 22'.5 S	56° 45'.4	51'.6	240° 38'.8	12'.6	10'.3	11'.1	
			71° 45'.5	50'.7	255° 10'.4	12'.5	4° 59'.2 N	11'.2	
Kochab	137° 19'.6	74° 05'.8 N	86° 45'.6	49'.8	269° 41'.9	12'.6	48'.0	11'.2	56'.8
Markab	13° 38'.8	15° 16'.6 N	101° 45'.7	48'.8	284° 13'.5	12'.6	36'.8	11'.2	
Menkar	314° 15'.3	4° 08'.3 N	116° 45'.8	47'.9	298° 45'.1	12'.5	25'.6	11'.3	
Menkent	148° 07'.6	36° 26'.0 S	131° 45'.9	47'.0	313° 16'.6	12'.6	14'.3	11'.3	
Miaplacidus	221° 38'.8	69° 46'.5 S	146° 46'.0	46'.0	327° 48'.2	12'.5	03'.0	11'.3	56'.9
			161° 46'.1	45'.1	342° 19'.7	12'.5	3° 51'.7 N	11'.4	
Mirfak	308° 40'.7	49° 54'.6 N	176° 46'.2	8° 44'.2 S	356° 51'.2	12'.5	3° 40'.3 N	11'.4	56'.9
Nunki	75° 58'.8	26° 16'.7 S	191° 46'.3	43'.2	11° 22'.7	12'.5	28'.9	11'.4	
Peacock	53° 20'.1	56° 41'.3 S	206° 46'.4	42'.3	25° 54'.2	12'.5	17'.5	11'.4	57'.0
Polaris	318° 02'.5	89° 19'.5 N	221° 46'.6	41'.4	40° 25'.7	12'.4	06'.1	11'.4	
Pollux	243° 27'.7	27° 59'.5 N	236° 46'.7	40'.4	54° 57'.1	12'.5	2° 54'.7 N	11'.5	
			251° 46'.8	39'.5	69° 28'.6	12'.4	43'.2	11'.5	
Procyon	244° 59'.7	5° 11'.2 N	266° 46'.9	38'.6	84° 00'.0	12'.4	31'.7	11'.5	
Rasalhague	96° 06'.7	12° 33'.0 N	281° 47'.0	37'.6	98° 31'.4	12'.4	20'.2	11'.6	57'.1
Regulus	207° 43'.4	11° 53'.9 N	296° 47'.1	36'.7	113° 02'.8	12'.4	08'.6	11'.5	
Rigel	281° 12'.2	8° 11'.5 S	311° 47'.2	35'.8	127° 34'.2	12'.4	1° 57'.1 N	11'.6	
Rigil Kent	139° 51'.6	60° 53'.1 S	326° 47'.3	34'.8	142° 05'.6	12'.4	45'.5	11'.6	
			341° 47'.4	33'.9	156° 37'.0	12'.3	33'.9	11'.6	57'.2
Sabik	102° 12'.8	15° 44'.4 S	356° 47'.5	8° 33'.0 S	171° 08'.3	12'.3	1° 22'.3 N	11'.6	57'.2
Schedar	349° 41'.2	56° 36'.7 N	11° 47'.6	32'.0	185° 39'.6	12'.3	10'.7	11'.7	
Shaula	96° 22'.3	37° 06'.6 S	26° 47'.7	31'.1	200° 10'.9	12'.3	0° 59'.0 N	11'.6	
Sirius	258° 33'.7	16° 44'.4 S	41° 47'.8	30'.1	214° 42'.2	12'.2	47'.4	11'.7	57'.3
Spica	158° 31'.2	11° 13'.9 S	56° 47'.9	29'.2	229° 13'.4	12'.3	35'.7	11'.7	
			71° 48'.1	28'.3	243° 44'.7	12'.2	24'.0	11'.7	
Suhail	222° 52'.1	43° 29'.5 S	86° 48'.2	27'.3	258° 15'.9	12'.1	12'.3	11'.7	
Vega	80° 39'.3	38° 47'.6 N	101° 48'.3	26'.4	272° 47'.0	12'.2	00'.6	11'.7	
Zuben'ubi	137° 05'.5	16° 05'.8 S	116° 48'.4	25'.5	287° 18'.2	12'.2	0° 11'.1 S	11'.7	57'.4
			131° 48'.5	24'.5	301° 49'.4	12'.1	22'.8	11'.7	
	SHA	Mer.Pass.	146° 48'.6	23'.6	316° 20'.5	12'.1	34'.5	11'.7	
Venus	28° 45'.2	11:45	161° 48'.7	22'.6	330° 51'.6	12'.0	46'.2	11'.7	
Mars	10° 37'.7	12:57							
Jupiter	294° 18'.6	18:00							
Saturn	140° 08'.0	04:19	SD 16'.2	d 0'.9	SD 15'.3		15'.4		15'.6

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 24	Moonrise 25	Moonrise 26
N 72°	05:29	06:46	07:57	15:07	16:59	18:50
N 70°	05:32	06:42	07:45	15:22	17:06	18:50
68°	05:34	06:38	07:36	15:35	17:11	18:49
66°	05:36	06:35	07:28	15:45	17:16	18:49
64°	05:37	06:32	07:21	15:53	17:20	18:49
62°	05:39	06:30	07:15	16:00	17:24	18:49
60°	05:39	06:27	07:10	16:06	17:27	18:49
N 58°	05:40	06:25	07:05	16:12	17:30	18:49
56°	05:41	06:24	07:01	16:17	17:32	18:49
54°	05:41	06:22	06:58	16:21	17:34	18:49
52°	05:41	06:20	06:54	16:25	17:36	18:49
50°	05:41	06:19	06:51	16:28	17:38	18:49
45°	05:41	06:15	06:45	16:36	17:42	18:49
N 40°	05:40	06:12	06:39	16:42	17:45	18:49
35°	05:40	06:09	06:34	16:48	17:48	18:49
30°	05:38	06:06	06:30	16:53	17:50	18:49
20°	05:35	06:00	06:23	17:01	17:55	18:49
N 10°	05:30	05:55	06:16	17:08	17:58	18:49
0°	05:24	05:49	06:10	17:15	18:02	18:49
S 10°	05:17	05:42	06:03	17:22	18:05	18:49
20°	05:08	05:34	05:56	17:29	18:09	18:49
30°	04:55	05:24	05:48	17:37	18:13	18:49
35°	04:47	05:17	05:43	17:42	18:16	18:49
40°	04:37	05:10	05:38	17:47	18:18	18:49
45°	04:24	05:01	05:32	17:53	18:22	18:49
S 50°	04:08	04:50	05:24	18:01	18:25	18:50
52°	04:01	04:45	05:21	18:04	18:27	18:50
54°	03:52	04:39	05:17	18:08	18:29	18:50
56°	03:42	04:32	05:12	18:12	18:31	18:50
58°	03:30	04:25	05:08	18:16	18:33	18:50
S 60°	03:16	04:16	05:02	18:21	18:36	18:50
S 62°	02:59	04:06	04:56	18:27	18:39	18:50

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 24	Moonset 25	Moonset 26
N 72°	16:31	17:42	19:00	07:18	07:05	06:53
N 70°	16:42	17:46	18:57	07:01	06:56	06:50
68°	16:52	17:49	18:54	06:48	06:48	06:48
66°	17:00	17:53	18:52	06:36	06:41	06:46
64°	17:07	17:55	18:50	06:27	06:36	06:44
62°	17:12	17:58	18:49	06:19	06:31	06:42
60°	17:17	18:00	18:48	06:11	06:27	06:41
N 58°	17:22	18:02	18:47	06:05	06:23	06:40
56°	17:26	18:04	18:47	06:00	06:20	06:39
54°	17:29	18:05	18:46	05:55	06:17	06:38
52°	17:33	18:07	18:46	05:50	06:14	06:37
50°	17:36	18:08	18:46	05:46	06:12	06:36
45°	17:42	18:12	18:46	05:37	06:06	06:34
N 40°	17:47	18:15	18:46	05:30	06:02	06:33
35°	17:52	18:18	18:47	05:23	05:58	06:31
30°	17:56	18:20	18:48	05:17	05:54	06:30
20°	18:04	18:26	18:52	05:08	05:48	06:28
N 10°	18:10	18:31	18:56	04:59	05:42	06:26
0°	18:16	18:37	19:02	04:50	05:37	06:24
S 10°	18:23	18:44	19:09	04:42	05:32	06:22
20°	18:30	18:52	19:18	04:33	05:27	06:21
30°	18:37	19:02	19:31	04:23	05:20	06:18
35°	18:42	19:08	19:39	04:17	05:16	06:17
40°	18:47	19:15	19:48	04:10	05:12	06:16
45°	18:53	19:24	20:01	04:02	05:07	06:14
S 50°	19:01	19:35	20:16	03:53	05:01	06:12
52°	19:04	19:40	20:24	03:48	04:59	06:11
54°	19:08	19:46	20:32	03:43	04:56	06:10
56°	19:12	19:52	20:42	03:38	04:52	06:09
58°	19:17	19:59	20:53	03:32	04:49	06:07
S 60°	19:22	20:08	21:07	03:25	04:44	06:06
S 62°	19:28	20:17	21:23	03:17	04:40	06:04

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
24	13 14	13 10	12:13	23:26	11:03	14d 98%
25	13 05	13 00	12:13	24:13	11:50	15d Full
26	12 55	12 50	12:13	00:13	12:37	16d 99%

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2013 Feb 27, 28, Mar. 1 (Wed, Thur, Fri)

GMT		ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.3		SATURN +0.5	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
27 Wednesday	00	156° 59'.6	183° 20'.3	12° 17'.5 S	166° 10'.6	4° 53'.9 S	91° 07'.4	21° 05'.1 N	297° 08'.9	12° 50'.3 S
	01	172° 02'.0	198° 19'.7	16'.4	181° 11'.3	53'.1	106° 09'.6	05'.2	312° 11'.4	50'.3
	02	187° 04'.5	213° 19'.2	15'.3	196° 12'.0	52'.3	121° 11'.9	05'.2	327° 13'.9	50'.3
	03	202° 07'.0	228° 18'.6	14'.3	211° 12'.6	51'.5	136° 14'.1	05'.2	342° 16'.4	50'.3
	04	217° 09'.4	243° 18'.1	13'.2	226° 13'.3	50'.7	151° 16'.3	05'.3	357° 18'.9	50'.2
	05	232° 11'.9	258° 17'.6	12'.1	241° 14'.0	49'.9	166° 18'.6	05'.3	12° 21'.4	50'.2
	06	247° 14'.3	273° 17'.0	11'.0	256° 14'.6	49'.1	181° 20'.8	05'.4	27° 23'.9	50'.2
	07	262° 16'.8	288° 16'.5	10'.0	271° 15'.3	48'.4	196° 23'.0	05'.4	42° 26'.4	50'.2
	08	277° 19'.3	303° 16'.0	08'.9	286° 15'.9	47'.6	211° 25'.3	05'.5	57° 28'.9	50'.2
	09	292° 21'.7	318° 15'.4	07'.8	301° 16'.6	46'.8	226° 27'.5	05'.5	72° 31'.4	50'.1
	10	307° 24'.2	333° 14'.9	06'.7	316° 17'.3	46'.0	241° 29'.7	05'.6	87° 33'.9	50'.1
	11	322° 26'.7	348° 14'.4	05'.6	331° 17'.9	45'.2	256° 31'.9	05'.6	102° 36'.4	50'.1
	12	337° 29'.1	3° 13'.8	12° 04'.6 S	346° 18'.6	4° 44'.4 S	271° 34'.2	21° 05'.6 N	117° 38'.9	12° 50'.1 S
	13	352° 31'.6	18° 13'.3	03'.5	1° 19'.3	43'.6	286° 36'.4	05'.7	132° 41'.4	50'.1
	14	7° 34'.1	33° 12'.8	02'.4	16° 19'.9	42'.8	301° 38'.6	05'.7	147° 43'.9	50'.0
	15	22° 36'.5	48° 12'.2	01'.3	31° 20'.6	42'.1	316° 40'.9	05'.8	162° 46'.4	50'.0
	16	37° 39'.0	63° 11'.7	00'.2	46° 21'.3	41'.3	331° 43'.1	05'.8	177° 48'.9	50'.0
	17	52° 41'.5	78° 11'.2	11° 59'.1 S	61° 21'.9	40'.5	346° 45'.3	05'.9	192° 51'.3	50'.0
	18	67° 43'.9	93° 10'.7	58'.0	76° 22'.6	39'.7	1° 47'.5	05'.9	207° 53'.8	50'.0
	19	82° 46'.4	108° 10'.1	57'.0	91° 23'.3	38'.9	16° 49'.8	06'.0	222° 56'.3	49'.9
	20	97° 48'.8	123° 09'.6	55'.9	106° 23'.9	38'.1	31° 52'.0	06'.0	237° 58'.8	49'.9
	21	112° 51'.3	138° 09'.1	54'.8	121° 24'.6	37'.3	46° 54'.2	06'.0	253° 01'.3	49'.9
	22	127° 53'.8	153° 08'.5	53'.7	136° 25'.2	36'.5	61° 56'.4	06'.1	268° 03'.8	49'.9
	23	142° 56'.2	168° 08'.0	52'.6	151° 25'.9	35'.8	76° 58'.7	06'.1	283° 06'.3	49'.8
28 Thursday	00	157° 58'.7	183° 07'.5	11° 51'.5 S	166° 26'.6	4° 35'.0 S	92° 00'.9	21° 06'.2 N	298° 08'.8	12° 49'.8 S
	01	173° 01'.2	198° 07'.0	50'.4	181° 27'.2	34'.2	107° 03'.1	06'.2	313° 11'.3	49'.8
	02	188° 03'.6	213° 06'.4	49'.3	196° 27'.9	33'.4	122° 05'.3	06'.3	328° 13'.8	49'.8
	03	203° 06'.1	228° 05'.9	48'.3	211° 28'.6	32'.6	137° 07'.6	06'.3	343° 16'.3	49'.8
	04	218° 08'.6	243° 05'.4	47'.2	226° 29'.2	31'.8	152° 09'.8	06'.4	358° 18'.8	49'.7
	05	233° 11'.0	258° 04'.9	46'.1	241° 29'.9	31'.0	167° 12'.0	06'.4	13° 21'.3	49'.7
	06	248° 13'.5	273° 04'.3	45'.0	256° 30'.6	30'.2	182° 14'.2	06'.5	28° 23'.8	49'.7
	07	263° 15'.9	288° 03'.8	43'.9	271° 31'.2	29'.4	197° 16'.5	06'.5	43° 26'.3	49'.7
	08	278° 18'.4	303° 03'.3	42'.8	286° 31'.9	28'.7	212° 18'.7	06'.5	58° 28'.8	49'.7
	09	293° 20'.9	318° 02'.8	41'.7	301° 32'.6	27'.9	227° 20'.9	06'.6	73° 31'.4	49'.6
	10	308° 23'.3	333° 02'.2	40'.6	316° 33'.2	27'.1	242° 23'.1	06'.6	88° 33'.9	49'.6
	11	323° 25'.8	348° 01'.7	39'.5	331° 33'.9	26'.3	257° 25'.4	06'.7	103° 36'.4	49'.6
	12	338° 28'.3	3° 01'.2	11° 38'.4 S	346° 34'.6	4° 25'.5 S	272° 27'.6	21° 06'.7 N	118° 38'.9	12° 49'.6 S
	13	353° 30'.7	18° 00'.7	37'.3	1° 35'.2	24'.7	287° 29'.8	06'.8	133° 41'.4	49'.5
	14	8° 33'.2	33° 00'.2	36'.2	16° 35'.9	23'.9	302° 32'.0	06'.8	148° 43'.9	49'.5
	15	23° 35'.7	47° 59'.6	35'.1	31° 36'.6	23'.1	317° 34'.2	06'.9	163° 46'.4	49'.5
	16	38° 38'.1	62° 59'.1	34'.0	46° 37'.2	22'.3	332° 36'.5	06'.9	178° 48'.9	49'.5
	17	53° 40'.6	77° 58'.6	32'.9	61° 37'.9	21'.5	347° 38'.7	07'.0	193° 51'.4	49'.5
	18	68° 43'.1	92° 58'.1	31'.8	76° 38'.6	20'.8	2° 40'.9	07'.0	208° 53'.9	49'.4
	19	83° 45'.5	107° 57'.6	30'.7	91° 39'.2	20'.0	17° 43'.1	07'.0	223° 56'.4	49'.4
	20	98° 48'.0	122° 57'.0	29'.6	106° 39'.9	19'.2	32° 45'.3	07'.1	238° 58'.9	49'.4
	21	113° 50'.4	137° 56'.5	28'.5	121° 40'.6	18'.4	47° 47'.6	07'.1	254° 01'.4	49'.4
	22	128° 52'.9	152° 56'.0	27'.4	136° 41'.2	17'.6	62° 49'.8	07'.2	269° 03'.9	49'.3
	23	143° 55'.4	167° 55'.5	26'.3	151° 41'.9	16'.8	77° 52'.0	07'.2	284° 06'.4	49'.3
1 Friday	00	158° 57'.8	182° 55'.0	11° 25'.2 S	166° 42'.6	4° 16'.0 S	92° 54'.2	21° 07'.3 N	299° 08'.9	12° 49'.3 S
	01	174° 00'.3	197° 54'.5	24'.1	181° 43'.2	15'.2	107° 56'.4	07'.3	314° 11'.4	49'.3
	02	189° 02'.8	212° 53'.9	23'.0	196° 43'.9	14'.4	122° 58'.7	07'.4	329° 13'.9	49'.3
	03	204° 05'.2	227° 53'.4	21'.9	211° 44'.6	13'.6	138° 00'.9	07'.4	344° 16'.4	49'.2
	04	219° 07'.7	242° 52'.9	20'.8	226° 45'.2	12'.9	153° 03'.1	07'.5	359° 18'.9	49'.2
	05	234° 10'.2	257° 52'.4	19'.7	241° 45'.9	12'.1	168° 05'.3	07'.5	14° 21'.4	49'.2
	06	249° 12'.6	272° 51'.9	18'.6	256° 46'.6	11'.3	183° 07'.5	07'.6	29° 23'.9	49'.2
	07	264° 15'.1	287° 51'.4	17'.5	271° 47'.3	10'.5	198° 09'.7	07'.6	44° 26'.4	49'.1
	08	279° 17'.6	302° 50'.9	16'.4	286° 47'.9	09'.7	213° 12'.0	07'.6	59° 28'.9	49'.1
	09	294° 20'.0	317° 50'.4	15'.3	301° 48'.6	08'.9	228° 14'.2	07'.7	74° 31'.4	49'.1
	10	309° 22'.5	332° 49'.8	14'.2	316° 49'.3	08'.1	243° 16'.4	07'.7	89° 33'.9	49'.1
	11	324° 24'.9	347° 49'.3	13'.1	331° 49'.9	07'.3	258° 18'.6	07'.8	104° 36'.4	49'.1
	12	339° 27'.4	2° 48'.8	11° 12'.0 S	346° 50'.6	4° 06'.5 S	273° 20'.8	21° 07'.8 N	119° 39'.0	12° 49'.0 S
	13	354° 29'.9	17° 48'.3	10'.9	1° 51'.3	05'.7	288° 23'.0	07'.9	134° 41'.5	49'.0
	14	9° 32'.3	32° 47'.8	09'.8	16° 51'.9	05'.0	303° 25'.2	07'.9	149° 44'.0	49'.0
	15	24° 34'.8	47° 47'.3	08'.6	31° 52'.6	04'.2	318° 27'.5	08'.0	164° 46'.5	49'.0
	16	39° 37'.3	62° 46'.8	07'.5	46° 53'.3	03'.4	333° 29'.7	08'.0	179° 49'.0	48'.9
	17	54° 39'.7	77° 46'.3	06'.4	61° 53'.9	02'.6	348° 31'.9	08'.1	194° 51'.5	48'.9
	18	69° 42'.2	92° 45'.8	05'.3	76° 54'.6	01'.8	3° 34'.1	08'.1	209° 54'.0	48'.9
	19	84° 44'.7	107° 45'.2	04'.2	91° 55'.3	01'.0	18° 36'.3	08'.2	224° 56'.5	48'.9
	20	99° 47'.1	122° 44'.7	03'.1	106° 56'.0	00'.2	33° 38'.5	08'.2	239° 59'.0	48'.8
	21	114° 49'.6	137° 44'.2	02'.0	121° 56'.6	3° 59'.4 S	48° 40'.7	08'.3	255° 01'.5	48'.8
	22	129° 52'.0	152° 43'.7	00'.9	136° 57'.3	58'.6	63° 42'.9	08'.3	270° 04'.0	48'.8
	23	144° 54'.5	167° 43'.2	10° 59'.7 S	151° 58'.0	57'.8	78° 45'.1	08'.4	285° 06'.5	48'.8
		M.P. 13:26	v -0'.5	d 1'.1	v 0'.7	d 0'.8	v 2'.2	d 0'.0	v 2'.5	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.7	40° 15'.4 S
Achernar	335° 27'.3	57° 10'.4 S
Acrux	173° 08'.9	63° 10'.3 S
Adhara	255° 12'.4	28° 59'.8 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.0 N
Alkaid	152° 58'.7	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.7 S
Alnilam	275° 46'.5	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.7	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.2 S
Antares	112° 26'.5	26° 27'.5 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.5	69° 02'.7 S
Avior	234° 17'.5	59° 33'.5 S
Bellatrix	278° 32'.1	6° 21'.5 N
Betelgeuse	271° 01'.4	7° 24'.3 N
Canopus	263° 56'.0	52° 42'.6 S
Capella	280° 34'.6	46° 00'.7 N
Deneb	49° 32'.0	45° 19'.6 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 55'.0 S
Dubhe	193° 51'.3	61° 40'.6 N
Elnath	278° 12'.8	28° 37'.0 N
Eltanin	90° 46'.4	51° 29'.0 N
Enif	33° 47'.6	9° 56'.1 N
Fomalhaut	15° 24'.6	29° 33'.1 S
Gacrux	172° 00'.6	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.0 S
Hamal	328° 01'.2	23° 31'.5 N
Kaus Aust.	83° 44'.2	34° 22'.5 S
Kochab	137° 19'.6	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.5	36° 26'.0 S
Miaplacidus	221° 38'.8	69° 46'.6 S
Mirfak	308° 40'.7	49° 54'.6 N
Nunki	75° 58'.7	26° 16'.6 S
Peacock	53° 20'.0	56° 41'.3 S
Polaris	318° 03'.9	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.7	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.2	8° 11'.5 S
Rigil Kent	139° 51'.6	60° 53'.1 S
Sabik	102° 12'.8	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.7 N
Shaula	96° 22'.3	37° 06'.6 S
Sirius	258° 33'.7	16° 44'.4 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.5 S
Vega	80° 39'.3	38° 47'.6 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	25° 08'.8	11:48
Mars	8° 27'.9	12:54
Jupiter	294° 02'.2	17:49
Saturn	140° 10'.1	04:07

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
176° 48'.8	8° 21'.7 S	345° 22'.6	12'.1	0° 57'.9 S	11'.8	57'.5
191° 48'.9	20'.8	359° 53'.7	12'.0	1° 09'.7 S	11'.7	
206° 49'.0	19'.8	14° 24'.7	12'.0	21'.4	11'.7	
221° 49'.2	18'.9	28° 55'.7	11'.9	33'.1	11'.8	
236° 49'.3	17'.9	43° 26'.6	12'.0	44'.9	11'.7	
251° 49'.4	17'.0	57° 57'.6	11'.9	56'.6	11'.7	57'.6
266° 49'.5	16'.1	72° 28'.5	11'.8	2° 08'.3 S	11'.8	
281° 49'.6	15'.1	86° 59'.3	11'.9	20'.1	11'.7	
296° 49'.7	14'.2	101° 30'.2	11'.8	31'.8	11'.7	
311° 49'.8	13'.2	116° 01'.0	11'.8	43'.5	11'.7	
326° 49'.9	12'.3	130° 31'.8	11'.7	55'.2	11'.7	57'.7
341° 50'.1	11'.3	145° 02'.5	11'.7	3° 06'.9 S	11'.7	
356° 50'.2	8° 10'.4 S	159° 33'.2	11'.7	3° 18'.6 S	11'.7	57'.7
11° 50'.3	09'.5	174° 03'.9	11'.6	30'.3	11'.7	
26° 50'.4	08'.5	188° 34'.5	11'.7	42'.0	11'.6	
41° 50'.5	07'.6	203° 05'.2	11'.5	53'.6	11'.7	57'.8
56° 50'.6	06'.6	217° 35'.7	11'.6	4° 05'.3 S	11'.6	
71° 50'.7	05'.7	232° 06'.3	11'.5	16'.9	11'.6	
86° 50'.9	04'.7	246° 36'.8	11'.5	28'.5	11'.6	
101° 51'.0	03'.8	261° 07'.3	11'.4	40'.1	11'.6	
116° 51'.1	02'.9	275° 37'.7	11'.4	51'.7	11'.6	57'.9
131° 51'.2	01'.9	290° 08'.1	11'.3	5° 03'.3 S	11'.5	
146° 51'.3	01'.0	304° 38'.4	11'.4	14'.8	11'.6	
161° 51'.4	00'.0	319° 08'.8	11'.2	26'.4	11'.5	
176° 51'.5	7° 59'.1 S	333° 39'.0	11'.3	5° 37'.9 S	11'.4	57'.9
191° 51'.7	58'.1	348° 09'.3	11'.2	49'.3	11'.5	58'.0
206° 51'.8	57'.2	2° 39'.5	11'.1	6° 00'.8 S	11'.4	
221° 51'.9	56'.3	17° 09'.6	11'.1	12'.2	11'.4	
236° 52'.0	55'.3	31° 39'.7	11'.1	23'.6	11'.4	
251° 52'.1	54'.4	46° 09'.8	11'.0	35'.0	11'.4	
266° 52'.2	53'.4	60° 39'.8	11'.0	46'.4	11'.3	
281° 52'.4	52'.5	75° 09'.8	11'.0	57'.7	11'.3	58'.1
296° 52'.5	51'.5	89° 39'.8	10'.8	7° 09'.0 S	11'.2	
311° 52'.6	50'.6	104° 09'.6	10'.9	20'.2	11'.2	
326° 52'.7	49'.6	118° 39'.5	10'.8	31'.4	11'.2	
341° 52'.8	48'.7	133° 09'.3	10'.8	42'.6	11'.2	
356° 53'.0	7° 47'.7 S	147° 39'.1	10'.7	7° 53'.8 S	11'.1	58'.1
11° 53'.1	46'.8	162° 08'.8	10'.6	8° 04'.9 S	11'.1	58'.2
26° 53'.2	45'.8	176° 38'.4	10'.7	16'.0	11'.0	
41° 53'.3	44'.9	191° 08'.1	10'.5	27'.0	11'.0	
56° 53'.4	43'.9	205° 37'.6	10'.6	38'.0	11'.0	
71° 53'.6	43'.0	220° 07'.2	10'.4	49'.0	10'.9	
86° 53'.7	42'.0	234° 36'.6	10'.5	59'.9	10'.8	58'.3
101° 53'.8	41'.1	249° 06'.1	10'.3	9° 10'.7 S	10'.9	
116° 53'.9	40'.2	263° 35'.4	10'.3	21'.6	10'.7	
131° 54'.0	39'.2	278° 04'.7	10'.3	32'.3	10'.8	
146° 54'.2	38'.3	292° 34'.0	10'.2	43'.1	10'.6	
161° 54'.3	37'.3	307° 03'.2	10'.2	53'.7	10'.7	
176° 54'.4	7° 36'.4 S	321° 32'.4	10'.1	10° 04'.4 S	10'.5	58'.3
191° 54'.5	35'.4	336° 01'.5	10'.1	14'.9	10'.6	58'.4
206° 54'.6	34'.5	350° 30'.6	10'.0	25'.5	10'.4	
221° 54'.8	33'.5	4° 59'.6	10'.0	35'.9	10'.5	
236° 54'.9	32'.6	19° 28'.6	9'.9	46'.4	10'.3	
251° 55'.0	31'.6	33° 57'.5	9'.8	56'.7	10'.3	
266° 55'.1	30'.7	48° 26'.3	9'.8	11° 07'.0 S	10'.3	
281° 55'.3	29'.7	62° 55'.1	9'.8	17'.3	10'.2	58'.5
296° 55'.4	28'.8	77° 23'.9	9'.7	27'.5	10'.1	
311° 55'.5	27'.8	91° 52'.6	9'.6	37'.6	10'.1	
326° 55'.6	26'.9	106° 21'.2	9'.6	47'.7	10'.0	
341° 55'.7	25'.9	120° 49'.8	9'.5	57'.7	9'.9	
356° 55'.9	7° 25'.0 S	135° 18'.3	9'.5	12° 07'.6 S	9'.9	58'.5
11° 56'.0	24'.0	149° 46'.8	9'.4	17'.5	9'.8	
26° 56'.1	23'.0	164° 15'.2	9'.4	27'.3	9'.7	58'.6
41° 56'.2	22'.1	178° 43'.6	9'.3	37'.0	9'.7	
56° 56'.4	21'.1	193° 11'.9	9'.2	46'.7	9'.6	
71° 56'.5	20'.2	207° 40'.1	9'.2	56'.3	9'.5	
86° 56'.6	19'.2	222° 08'.3	9'.1	13° 05'.8 S	9'.5	
101° 56'.7	18'.3	236° 36'.4	9'.1	15'.3	9'.4	
116° 56'.9	17'.3	251° 04'.5	9'.0	24'.7	9'.3	
131° 57'.0	16'.4	265° 32'.5	9'.0	34'.0	9'.2	
146° 57'.1	15'.4	280° 00'.5	8'.9	43'.2	9'.2	58'.7
161° 57'.2	14'.5	294° 28'.4	8'.8	52'.4	9'.0	
SD 16'.1	d 0'.9	SD	15'.7	15'.8	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 1
N 72°	05:14	06:32	07:41	20:43	22:42	24:53
N 70°	05:19	06:29	07:31	20:36	22:26	24:22
68°	05:22	06:27	07:23	20:30	22:13	23:59
66°	05:25	06:24	07:16	20:24	22:02	23:41
64°	05:28	06:22	07:10	20:20	21:53	23:27
62°	05:30	06:21	07:05	20:16	21:45	23:15
60°	05:31	06:19	07:01	20:13	21:39	23:05
N 58°	05:32	06:18	06:57	20:10	21:33	22:56
56°	05:33	06:16	06:54	20:08	21:28	22:49
54°	05:34	06:15	06:51	20:06	21:23	22:42
52°	05:35	06:14	06:48	20:04	21:19	22:36
50°	05:35	06:13	06:45	20:02	21:16	22:30
45°	05:36	06:10	06:40	19:58	21:08	22:18
N 40°	05:36	06:08	06:35	19:54	21:01	22:08
35°	05:36	06:05	06:31	19:51	20:55	22:00
30°	05:35	06:03	06:27	19:49	20:50	21:53
20°	05:33	05:58	06:20	19:45	20:42	21:40
N 10°	05:29	05:54	06:15	19:41	20:34	21:29
0°	05:24	05:48	06:09	19:37	20:27	21:19
S 10°	05:18	05:42	06:04	19:34	20:20	21:09
20°	05:09	05:35	05:57	19:30	20:13	20:58
30°	04:57	05:26	05:50	19:26	20:05	20:46
35°	04:50	05:20	05:46	19:24	20:00	20:39
40°	04:41	05:14	05:41	19:21	19:54	20:31
45°	04:29	05:06	05:36	19:18	19:48	20:22
S 50°	04:15	04:56	05:29	19:14	19:41	20:11
52°	04:07	04:51	05:26	19:13	19:37	20:06
54°	03:59	04:45	05:23	19:11	19:34	20:00
56°	03:50	04:40	05:19	19:09	19:30	19:54
58°	03:40	04:33	05:15	19:07	19:25	19:47
S 60°	03:27	04:25	05:10	19:04	19:20	19:39
S 62°	03:12	04:16	05:05	19:01	19:14	19:30

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 27	Moonset 28	Moonset 1
N 72°	16:46	17:55	19:14	06:42	06:29	06:15
N 70°	16:55	17:58	19:09	06:45	06:39	06:33
68°	17:04	18:00	19:05	06:47	06:47	06:48
66°	17:10	18:02	19:02	06:50	06:54	07:00
64°	17:16	18:04	18:59	06:52	07:00	07:10
62°	17:21	18:06	18:57	06:53	07:05	07:19
60°	17:25	18:07	18:55	06:55	07:09	07:27
N 58°	17:29	18:08	18:54	06:56	07:13	07:33
56°	17:32	18:10	18:53	06:57	07:17	07:39
54°	17:35	18:11	18:52	06:58	07:20	07:44
52°	17:38	18:12	18:51	06:59	07:23	07:49
50°	17:41	18:13	18:51	07:00	07:25	07:53
45°	17:46	18:16	18:50	07:02	07:31	08:03
N 40°	17:51	18:18	18:49	07:04	07:36	08:11
35°	17:55	18:20	18:50	07:05	07:40	08:18
30°	17:58	18:22	18:50	07:06	07:44	08:24
20°	18:05	18:27	18:53	07:08	07:50	08:34
N 10°	18:10	18:32	18:56	07:10	07:56	08:43
0°	18:16	18:37	19:01	07:12	08:01	08:52
S 10°	18:21	18:43	19:07	07:14	08:06	09:00
20°	18:27	18:50	19:16	07:15	08:12	09:09
30°	18:34	18:58	19:27	07:18	08:18	09:20
35°	18:38	19:04	19:34	07:19	08:22	09:26
40°	18:43	19:11	19:43	07:20	08:26	09:33
45°	18:48	19:18	19:55	07:22	08:31	09:41
S 50°	18:55	19:28	20:09	07:23	08:37	09:51
52°	18:58	19:33	20:16	07:24	08:39	09:55
54°	19:01	19:38	20:24	07:25	08:42	10:00
56°	19:05	19:44	20:33	07:26	08:46	10:06
58°	19:09	19:50	20:43	07:27	08:49	10:12
S 60°	19:13	19:58	20:55	07:29	08:53	10:19
S 62°	19:19	20:07	21:10	07:30	08:58	10:27

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
27	12 45	12 40	12:13	01:00	13:25	17d 97%
28	12 34	12 28	12:12	01:49	14:14	18d 92%
1	12 23	12 17	12:12	02:39	15:05	19d 85%

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2013 March 2, 3, 4 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.3		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
2 Saturday 00	159° 57'.0	182° 42'.7	10° 58'.6 S	166° 58'.6	3° 57'.1 S	93° 47'.4	21° 08'.4 N	300° 09'.0	12° 48'.7 S
01	174° 59'.4	197° 42'.2	57'.5	181° 59'.3	56'.3	108° 49'.6	08'.4	315° 11'.5	48'.7
02	190° 01'.9	212° 41'.7	56'.4	197° 00'.0	55'.5	123° 51'.8	08'.5	330° 14'.1	48'.7
03	205° 04'.4	227° 41'.2	55'.3	212° 00'.6	54'.7	138° 54'.0	08'.5	345° 16'.6	48'.7
04	220° 06'.8	242° 40'.7	54'.2	227° 01'.3	53'.9	153° 56'.2	08'.6	0° 19'.1	48'.7
05	235° 09'.3	257° 40'.2	53'.1	242° 02'.0	53'.1	168° 58'.4	08'.6	15° 21'.6	48'.6
06	250° 11'.8	272° 39'.7	51'.9	257° 02'.7	52'.3	184° 00'.6	08'.7	30° 24'.1	48'.6
07	265° 14'.2	287° 39'.2	50'.8	272° 03'.3	51'.5	199° 02'.8	08'.7	45° 26'.6	48'.6
08	280° 16'.7	302° 38'.7	49'.7	287° 04'.0	50'.7	214° 05'.0	08'.8	60° 29'.1	48'.6
09	295° 19'.2	317° 38'.2	48'.6	302° 04'.7	49'.9	229° 07'.2	08'.8	75° 31'.6	48'.5
10	310° 21'.6	332° 37'.7	47'.5	317° 05'.3	49'.1	244° 09'.4	08'.9	90° 34'.1	48'.5
11	325° 24'.1	347° 37'.2	46'.3	332° 06'.0	48'.3	259° 11'.7	08'.9	105° 36'.6	48'.5
12	340° 26'.5	2° 36'.7	10° 45'.2 S	347° 06'.7	3° 47'.6 S	274° 13'.9	21° 09'.0 N	120° 39'.2	12° 48'.5 S
13	355° 29'.0	17° 36'.2	44'.1	2° 07'.3	46'.8	289° 16'.1	09'.0	135° 41'.7	48'.4
14	10° 31'.5	32° 35'.7	43'.0	17° 08'.0	46'.0	304° 18'.3	09'.1	150° 44'.2	48'.4
15	25° 33'.9	47° 35'.2	41'.9	32° 08'.7	45'.2	319° 20'.5	09'.1	165° 46'.7	48'.4
16	40° 36'.4	62° 34'.7	40'.7	47° 09'.4	44'.4	334° 22'.7	09'.2	180° 49'.2	48'.4
17	55° 38'.9	77° 34'.2	39'.6	62° 10'.0	43'.6	349° 24'.9	09'.2	195° 51'.7	48'.3
18	70° 41'.3	92° 33'.7	38'.5	77° 10'.7	42'.8	4° 27'.1	09'.2	210° 54'.2	48'.3
19	85° 43'.8	107° 33'.2	37'.4	92° 11'.4	42'.0	19° 29'.3	09'.3	225° 56'.7	48'.3
20	100° 46'.3	122° 32'.7	36'.2	107° 12'.1	41'.2	34° 31'.5	09'.3	240° 59'.2	48'.3
21	115° 48'.7	137° 32'.2	35'.1	122° 12'.7	40'.4	49° 33'.7	09'.4	256° 01'.7	48'.2
22	130° 51'.2	152° 31'.7	34'.0	137° 13'.4	39'.6	64° 35'.9	09'.4	271° 04'.3	48'.2
23	145° 53'.6	167° 31'.2	32'.9	152° 14'.1	38'.9	79° 38'.1	09'.5	286° 06'.8	48'.2
3 Sunday 00	160° 56'.1	182° 30'.7	10° 31'.7 S	167° 14'.7	3° 38'.1 S	94° 40'.3	21° 09'.5 N	301° 09'.3	12° 48'.2 S
01	175° 58'.6	197° 30'.2	30'.6	182° 15'.4	37'.3	109° 42'.5	09'.6	316° 11'.8	48'.1
02	191° 01'.0	212° 29'.7	29'.5	197° 16'.1	36'.5	124° 44'.7	09'.6	331° 14'.3	48'.1
03	206° 03'.5	227° 29'.2	28'.4	212° 16'.8	35'.7	139° 46'.9	09'.7	346° 16'.8	48'.1
04	221° 06'.0	242° 28'.7	27'.2	227° 17'.4	34'.9	154° 49'.1	09'.7	1° 19'.3	48'.1
05	236° 08'.4	257° 28'.2	26'.1	242° 18'.1	34'.1	169° 51'.3	09'.8	16° 21'.8	48'.0
06	251° 10'.9	272° 27'.7	25'.0	257° 18'.8	33'.3	184° 53'.5	09'.8	31° 24'.4	48'.0
07	266° 13'.4	287° 27'.2	23'.8	272° 19'.4	32'.5	199° 55'.7	09'.9	46° 26'.9	48'.0
08	281° 15'.8	302° 26'.7	22'.7	287° 20'.1	31'.7	214° 57'.9	09'.9	61° 29'.4	48'.0
09	296° 18'.3	317° 26'.2	21'.6	302° 20'.8	30'.9	230° 00'.1	10'.0	76° 31'.9	47'.9
10	311° 20'.8	332° 25'.7	20'.4	317° 21'.5	30'.1	245° 02'.3	10'.0	91° 34'.4	47'.9
11	326° 23'.2	347° 25'.2	19'.3	332° 22'.1	29'.3	260° 04'.5	10'.1	106° 36'.9	47'.9
12	341° 25'.7	2° 24'.7	10° 18'.2 S	347° 22'.8	3° 28'.6 S	275° 06'.7	21° 10'.1 N	121° 39'.4	12° 47'.9 S
13	356° 28'.1	17° 24'.2	17'.1	2° 23'.5	27'.8	290° 08'.9	10'.2	136° 42'.0	47'.8
14	11° 30'.6	32° 23'.8	15'.9	17° 24'.2	27'.0	305° 11'.1	10'.2	151° 44'.5	47'.8
15	26° 33'.1	47° 23'.3	14'.8	32° 24'.8	26'.2	320° 13'.3	10'.3	166° 47'.0	47'.8
16	41° 35'.5	62° 22'.8	13'.7	47° 25'.5	25'.4	335° 15'.5	10'.3	181° 49'.5	47'.8
17	56° 38'.0	77° 22'.3	12'.5	62° 26'.2	24'.6	350° 17'.7	10'.4	196° 52'.0	47'.7
18	71° 40'.5	92° 21'.8	11'.4	77° 26'.9	23'.8	5° 19'.9	10'.4	211° 54'.5	47'.7
19	86° 42'.9	107° 21'.3	10'.2	92° 27'.5	23'.0	20° 22'.1	10'.5	226° 57'.0	47'.7
20	101° 45'.4	122° 20'.8	09'.1	107° 28'.2	22'.2	35° 24'.3	10'.5	241° 59'.6	47'.7
21	116° 47'.9	137° 20'.3	08'.0	122° 28'.9	21'.4	50° 26'.5	10'.6	257° 02'.1	47'.6
22	131° 50'.3	152° 19'.8	06'.8	137° 29'.6	20'.6	65° 28'.7	10'.6	272° 04'.6	47'.6
23	146° 52'.8	167° 19'.3	05'.7	152° 30'.2	19'.8	80° 30'.9	10'.6	287° 07'.1	47'.6
4 Monday 00	161° 55'.3	182° 18'.9	10° 04'.6 S	167° 30'.9	3° 19'.0 S	95° 33'.1	21° 10'.7 N	302° 09'.6	12° 47'.6 S
01	176° 57'.7	197° 18'.4	03'.4	182° 31'.6	18'.3	110° 35'.3	10'.7	317° 12'.1	47'.5
02	192° 00'.2	212° 17'.9	02'.3	197° 32'.2	17'.5	125° 37'.5	10'.8	332° 14'.7	47'.5
03	207° 02'.6	227° 17'.4	01'.1	212° 32'.9	16'.7	140° 39'.7	10'.8	347° 17'.2	47'.5
04	222° 05'.1	242° 16'.9	00'.0	227° 33'.6	15'.9	155° 41'.9	10'.9	2° 19'.7	47'.5
05	237° 07'.6	257° 16'.4	9° 58'.9 S	242° 34'.3	15'.1	170° 44'.1	10'.9	17° 22'.2	47'.4
06	252° 10'.0	272° 15'.9	57'.7	257° 34'.9	14'.3	185° 46'.3	11'.0	32° 24'.7	47'.4
07	267° 12'.5	287° 15'.5	56'.6	272° 35'.6	13'.5	200° 48'.5	11'.0	47° 27'.2	47'.4
08	282° 15'.0	302° 15'.0	55'.4	287° 36'.3	12'.7	215° 50'.7	11'.1	62° 29'.8	47'.3
09	297° 17'.4	317° 14'.5	54'.3	302° 37'.0	11'.9	230° 52'.9	11'.1	77° 32'.3	47'.3
10	312° 19'.9	332° 14'.0	53'.2	317° 37'.6	11'.1	245° 55'.1	11'.2	92° 34'.8	47'.3
11	327° 22'.4	347° 13'.5	52'.0	332° 38'.3	10'.3	260° 57'.2	11'.2	107° 37'.3	47'.3
12	342° 24'.8	2° 13'.0	9° 50'.9 S	347° 39'.0	3° 09'.5 S	275° 59'.4	21° 11'.3 N	122° 39'.8	12° 47'.2 S
13	357° 27'.3	17° 12'.6	49'.7	2° 39'.7	08'.7	291° 01'.6	11'.3	137° 42'.4	47'.2
14	12° 29'.8	32° 12'.1	48'.6	17° 40'.3	07'.9	306° 03'.8	11'.4	152° 44'.9	47'.2
15	27° 32'.2	47° 11'.6	47'.4	32° 41'.0	07'.2	321° 06'.0	11'.4	167° 47'.4	47'.2
16	42° 34'.7	62° 11'.1	46'.3	47° 41'.7	06'.4	336° 08'.2	11'.5	182° 49'.9	47'.1
17	57° 37'.1	77° 10'.6	45'.1	62° 42'.4	05'.6	351° 10'.4	11'.5	197° 52'.4	47'.1
18	72° 39'.6	92° 10'.1	44'.0	77° 43'.1	04'.8	6° 12'.6	11'.6	212° 54'.9	47'.1
19	87° 42'.1	107° 09'.7	42'.9	92° 43'.7	04'.0	21° 14'.8	11'.6	227° 57'.5	47'.1
20	102° 44'.5	122° 09'.2	41'.7	107° 44'.4	03'.2	36° 17'.0	11'.7	243° 00'.0	47'.0
21	117° 47'.0	137° 08'.7	40'.6	122° 45'.1	02'.4	51° 19'.2	11'.7	258° 02'.5	47'.0
22	132° 49'.5	152° 08'.2	39'.4	137° 45'.8	01'.6	66° 21'.3	11'.8	273° 05'.0	47'.0
23	147° 51'.9	167° 07'.7	38'.3	152° 46'.4	00'.8	81° 23'.5	11'.8	288° 07'.5	46'.9
	M.P. 13:14	v -0'.5	d 1'.1	v 0'.7	d 0'.8	v 2'.2	d 0'.0	v 2'.5	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.7	40° 15'.4 S
Achernar	335° 27'.4	57° 10'.4 S
Acrux	173° 08'.8	63° 10'.3 S
Adhara	255° 12'.5	28° 59'.8 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.0 N
Alkaid	152° 58'.7	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.7 S
Alnilam	275° 46'.5	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.6	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.2 S
Antares	112° 26'.4	26° 27'.5 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.5	69° 02'.7 S
Avior	234° 17'.6	59° 33'.5 S
Bellatrix	278° 32'.1	6° 21'.5 N
Betelgeuse	271° 01'.4	7° 24'.3 N
Canopus	263° 56'.0	52° 42'.6 S
Capella	280° 34'.6	46° 00'.7 N
Deneb	49° 32'.0	45° 19'.6 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 55'.0 S
Dubhe	193° 51'.3	61° 40'.6 N
Elnath	278° 12'.8	28° 37'.0 N
Eltanin	90° 46'.4	51° 29'.0 N
Enif	33° 47'.6	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.5	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.0 S
Hamal	328° 01'.2	23° 31'.5 N
Kaus Aust.	83° 44'.2	34° 22'.5 S
Kochab	137° 19'.5	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.5	36° 26'.0 S
Miaplacidus	221° 38'.8	69° 46'.6 S
Mirfak	308° 40'.8	49° 54'.6 N
Nunki	75° 58'.7	26° 16'.6 S
Peacock	53° 20'.0	56° 41'.3 S
Polaris	318° 04'.9	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.7	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.2	8° 11'.5 S
Rigil Kent	139° 51'.6	60° 53'.1 S
Sabik	102° 12'.8	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.7 N
Shaula	96° 22'.2	37° 06'.6 S
Sirius	258° 33'.7	16° 44'.4 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.5 S
Vega	80° 39'.3	38° 47'.6 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	21° 34'.6	11:50
Mars	6° 18'.6	12:50
Jupiter	293° 44'.2	17:39
Saturn	140° 13'.2	03:55

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
2 00	176° 57'.4	7° 13'.5 S	308° 56'.2	8'.8	14° 01'.4 S	9'.0	58'.7
01	191° 57'.5	12'.6	323° 24'.0	8'.8	10'.4	8'.9	
02	206° 57'.6	11'.6	337° 51'.8	8'.6	19'.3	8'.9	
03	221° 57'.8	10'.7	352° 19'.4	8'.6	28'.2	8'.7	
04	236° 57'.9	09'.7	6° 47'.0	8'.6	36'.9	8'.7	
05	251° 58'.0	08'.7	21° 14'.6	8'.5	45'.6	8'.6	
06	266° 58'.1	07'.8	35° 42'.1	8'.4	54'.2	8'.5	58'.8
07	281° 58'.3	06'.8	50° 09'.5	8'.4	15° 02'.7 S	8'.4	
08	296° 58'.4	05'.9	64° 36'.9	8'.4	11'.1	8'.3	
09	311° 58'.5	04'.9	79° 04'.3	8'.2	19'.4	8'.3	
10	326° 58'.6	04'.0	93° 31'.5	8'.2	27'.7	8'.1	
11	341° 58'.8	03'.0	107° 58'.7	8'.2	35'.8	8'.1	
12	356° 58'.9	7° 02'.1 S	122° 25'.9	8'.1	15° 43'.9 S	7'.9	58'.8
13	11° 59'.0	01'.1	136° 53'.0	8'.1	51'.8	7'.9	
14	26° 59'.2	00'.1	151° 20'.1	7'.9	59'.7	7'.8	
15	41° 59'.3	6° 59'.2 S	165° 47'.0	8'.0	16° 07'.5 S	7'.6	
16	56° 59'.4	58'.2	180° 14'.0	7'.8	15'.1	7'.6	58'.9
17	71° 59'.6	57'.3	194° 40'.8	7'.9	22'.7	7'.5	
18	86° 59'.7	56'.3	209° 07'.7	7'.7	30'.2	7'.4	
19	101° 59'.8	55'.4	223° 34'.4	7'.7	37'.6	7'.2	
20	116° 59'.9	54'.4	238° 01'.1	7'.7	44'.8	7'.2	
21	132° 00'.1	53'.4	252° 27'.8	7'.6	52'.0	7'.1	
22	147° 00'.2	52'.5	266° 54'.4	7'.5	59'.1	7'.0	
23	162° 00'.3	51'.5	281° 20'.9	7'.5	17° 06'.1 S	6'.9	
3 00	177° 00'.5	6° 50'.6 S	295° 47'.4	7'.5	17° 13'.0 S	6'.7	58'.9
01	192° 00'.6	49'.6	310° 13'.9	7'.4	19'.7	6'.7	
02	207° 00'.7	48'.7	324° 40'.3	7'.3	26'.4	6'.5	59'.0
03	222° 00'.9	47'.7	339° 06'.6	7'.3	32'.9	6'.5	
04	237° 01'.0	46'.7	353° 32'.9	7'.2	39'.4	6'.3	
05	252° 01'.1	45'.8	7° 59'.1	7'.2	45'.7	6'.2	
06	267° 01'.3	44'.8	22° 25'.3	7'.1	51'.9	6'.2	
07	282° 01'.4	43'.9	36° 51'.4	7'.1	58'.1	6'.0	
08	297° 01'.5	42'.9	51° 17'.5	7'.0	18° 04'.1 S	5'.9	
09	312° 01'.7	41'.9	65° 43'.5	7'.0	10'.0	5'.7	
10	327° 01'.8	41'.0	80° 09'.5	6'.9	15'.7	5'.7	
11	342° 01'.9	40'.0	94° 35'.4	6'.9	21'.4	5'.5	
12	357° 02'.1	6° 39'.1 S	109° 01'.3	6'.8	18° 26'.9 S	5'.5	59'.0
13	12° 02'.2	38'.1	123° 27'.1	6'.8	32'.4	5'.3	
14	27° 02'.3	37'.1	137° 52'.9	6'.8	37'.7	5'.2	59'.1
15	42° 02'.5	36'.2	152° 18'.7	6'.7	42'.9	5'.1	
16	57° 02'.6	35'.2	166° 44'.4	6'.6	48'.0	4'.9	
17	72° 02'.7	34'.3	181° 10'.0	6'.6	52'.9	4'.9	
18	87° 02'.9	33'.3	195° 35'.6	6'.6	57'.8	4'.7	
19	102° 03'.0	32'.3	210° 01'.2	6'.5	19° 02'.5 S	4'.6	
20	117° 03'.1	31'.4	224° 26'.7	6'.5	07'.1	4'.5	
21	132° 03'.3	30'.4	238° 52'.2	6'.5	11'.6	4'.3	
22	147° 03'.4	29'.5	253° 17'.7	6'.4	15'.9	4'.2	
23	162° 03'.5	28'.5	267° 43'.1	6'.4	20'.1	4'.2	
4 00	177° 03'.7	6° 27'.5 S	282° 08'.5	6'.3	19° 24'.3 S	3'.9	59'.1
01	192° 03'.8	26'.6	296° 33'.8	6'.3	28'.2	3'.9	
02	207° 03'.9	25'.6	310° 59'.1	6'.3	32'.1	3'.7	
03	222° 04'.1	24'.6	325° 24'.4	6'.2	35'.8	3'.6	
04	237° 04'.2	23'.7	339° 49'.6	6'.2	39'.4	3'.5	
05	252° 04'.4	22'.7	354° 14'.8	6'.1	42'.9	3'.3	
06	267° 04'.5	21'.8	8° 39'.9	6'.2	46'.2	3'.3	59'.2
07	282° 04'.6	20'.8	23° 05'.1	6'.1	49'.5	3'.1	
08	297° 04'.8	19'.8	37° 30'.2	6'.0	52'.6	2'.9	
09	312° 04'.9	18'.9	51° 55'.2	6'.1	55'.5	2'.8	
10	327° 05'.0	17'.9	66° 20'.3	6'.0	58'.3	2'.7	
11	342° 05'.2	16'.9	80° 45'.3	6'.0	20° 01'.0 S	2'.6	
12	357° 05'.3	6° 16'.0 S	95° 10'.3	6'.0	20° 03'.6 S	2'.4	59'.2
13	12° 05'.5	15'.0	109° 35'.3	5'.9	06'.0	2'.4	
14	27° 05'.6	14'.0	124° 00'.2	5'.9	08'.4	2'.1	
15	42° 05'.7	13'.1	138° 25'.1	5'.9	10'.5	2'.1	
16	57° 05'.9	12'.1	152° 50'.0	5'.9	12'.6	1'.9	
17	72° 06'.0	11'.2	167° 14'.9	5'.8	14'.5	1'.7	
18	87° 06'.1	10'.2	181° 39'.7	5'.9	16'.2	1'.7	
19	102° 06'.3	09'.2	196° 04'.6	5'.8	17'.9	1'.5	
20	117° 06'.4	08'.3	210° 29'.4	5'.8	19'.4	1'.4	
21	132° 06'.6	07'.3	224° 54'.2	5'.8	20'.8	1'.2	
22	147° 06'.7	06'.3	239° 19'.0	5'.7	22'.0	1'.1	
23	162° 06'.8	05'.4	253° 43'.7	5'.8	23'.1	1'.0	
	SD 16'.1	d 1'.0	SD	16'.0	16'.1	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 2	Moonrise 3	Moonrise 4
N 72°	04:59	06:17	07:25	00:53	03:49	-
N 70°	05:05	06:16	07:17	00:22	02:26	04:55
68°	05:10	06:15	07:11	-	01:47	03:31
66°	05:14	06:13	07:05	-	01:20	02:53
64°	05:18	06:12	07:00	-	01:00	02:26
62°	05:20	06:12	06:56	-	00:44	02:06
60°	05:23	06:11	06:52	-	00:30	01:49
N 58°	05:24	06:10	06:49	-	00:18	01:35
56°	05:26	06:09	06:46	-	00:08	01:23
54°	05:27	06:08	06:44	23:59	-	01:12
52°	05:28	06:07	06:41	23:51	-	01:03
50°	05:29	06:07	06:39	23:44	-	00:54
45°	05:31	06:05	06:34	23:29	-	00:36
N 40°	05:32	06:03	06:30	23:16	-	00:22
35°	05:32	06:01	06:27	23:05	-	00:10
30°	05:32	06:00	06:24	22:56	23:59	25:00
20°	05:31	05:56	06:18	22:40	23:41	24:41
N 10°	05:28	05:52	06:13	22:26	23:25	24:24
0°	05:24	05:48	06:09	22:13	23:10	24:08
S 10°	05:18	05:43	06:04	22:01	22:55	23:53
20°	05:10	05:36	05:58	21:47	22:40	23:36
30°	05:00	05:28	05:52	21:32	22:22	23:17
35°	04:53	05:23	05:49	21:23	22:11	23:06
40°	04:44	05:17	05:45	21:12	21:59	22:53
45°	04:34	05:10	05:40	21:00	21:45	22:38
S 50°	04:21	05:01	05:34	20:46	21:28	22:20
52°	04:14	04:57	05:32	20:39	21:20	22:11
54°	04:07	04:52	05:29	20:32	21:12	22:01
56°	03:58	04:47	05:25	20:24	21:02	21:50
58°	03:49	04:40	05:22	20:14	20:50	21:38
S 60°	03:37	04:34	05:18	20:04	20:37	21:23
S 62°	03:24	04:26	05:13	19:51	20:22	21:06

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 2	Moonset 3	Moonset 4
N 72°	17:00	18:09	19:28	05:54	04:53	-
N 70°	17:08	18:10	19:21	06:27	06:17	05:48
68°	17:15	18:11	19:16	06:50	06:56	07:11
66°	17:20	18:12	19:11	07:09	07:24	07:50
64°	17:25	18:13	19:08	07:24	07:45	08:17
62°	17:29	18:14	19:05	07:37	08:02	08:38
60°	17:33	18:14	19:03	07:48	08:16	08:55
N 58°	17:36	18:15	19:01	07:57	08:28	09:09
56°	17:39	18:16	18:59	08:06	08:39	09:22
54°	17:41	18:17	18:58	08:13	08:48	09:32
52°	17:43	18:17	18:56	08:20	08:57	09:42
50°	17:46	18:18	18:55	08:26	09:04	09:51
45°	17:50	18:20	18:54	08:39	09:20	10:09
N 40°	17:54	18:21	18:53	08:49	09:33	10:24
35°	17:57	18:23	18:52	08:59	09:45	10:36
30°	18:00	18:24	18:52	09:07	09:55	10:47
20°	18:06	18:28	18:54	09:21	10:12	11:06
N 10°	18:11	18:32	18:56	09:33	10:26	11:22
0°	18:15	18:36	19:00	09:45	10:40	11:38
S 10°	18:20	18:41	19:06	09:56	10:54	11:53
20°	18:25	18:47	19:13	10:09	11:09	12:10
30°	18:31	18:55	19:23	10:23	11:26	12:28
35°	18:34	19:00	19:30	10:31	11:36	12:39
40°	18:38	19:06	19:38	10:41	11:48	12:52
45°	18:43	19:13	19:49	10:52	12:01	13:07
S 50°	18:49	19:22	20:02	11:05	12:17	13:25
52°	18:51	19:26	20:08	11:11	12:25	13:34
54°	18:54	19:30	20:15	11:18	12:34	13:43
56°	18:57	19:36	20:24	11:26	12:43	13:54
58°	19:01	19:42	20:33	11:35	12:54	14:07
S 60°	19:04	19:48	20:44	11:45	13:07	14:21
S 62°	19:09	19:56	20:57	11:56	13:22	14:38

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
2	12 11	12 05	12:12	03:32	15:59	20d 76%
3	11 58	11 52	12:12	04:27	16:55	21d 66%
4	11 46	11 39	12:12	05:24	17:53	22d 55%

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2013 March 5, 6, 7 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.3		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
5 Tuesday 00	162° 54'.4	182° 07'.3	9° 37'.1 S	167° 47'.1	3° 00'.0 S	96° 25'.7	21° 11'.9 N	303° 10'.1	12° 46'.9 S
01	177° 56'.9	197° 06'.8	36'.0	182° 47'.8	2° 59'.2 S	111° 27'.9	11'.9	318° 12'.6	46'.9
02	192° 59'.3	212° 06'.3	34'.8	197° 48'.5	58'.4	126° 30'.1	12'.0	333° 15'.1	46'.9
03	208° 01'.8	227° 05'.8	33'.7	212° 49'.1	57'.6	141° 32'.3	12'.0	348° 17'.6	46'.8
04	223° 04'.2	242° 05'.4	32'.5	227° 49'.8	56'.8	156° 34'.5	12'.1	3° 20'.2	46'.8
05	238° 06'.7	257° 04'.9	31'.4	242° 50'.5	56'.1	171° 36'.7	12'.1	18° 22'.7	46'.8
06	253° 09'.2	272° 04'.4	30'.2	257° 51'.2	55'.3	186° 38'.8	12'.2	33° 25'.2	46'.8
07	268° 11'.6	287° 03'.9	29'.1	272° 51'.8	54'.5	201° 41'.0	12'.2	48° 27'.7	46'.7
08	283° 14'.1	302° 03'.5	27'.9	287° 52'.5	53'.7	216° 43'.2	12'.3	63° 30'.2	46'.7
09	298° 16'.6	317° 03'.0	26'.8	302° 53'.2	52'.9	231° 45'.4	12'.3	78° 32'.8	46'.7
10	313° 19'.0	332° 02'.5	25'.6	317° 53'.9	52'.1	246° 47'.6	12'.4	93° 35'.3	46'.6
11	328° 21'.5	347° 02'.0	24'.4	332° 54'.6	51'.3	261° 49'.8	12'.4	108° 37'.8	46'.6
12	343° 24'.0	2° 01'.6	9° 23'.3 S	347° 55'.2	2° 50'.5 S	276° 52'.0	21° 12'.5 N	123° 40'.3	12° 46'.6 S
13	358° 26'.4	17° 01'.1	22'.1	2° 55'.9	49'.7	291° 54'.2	12'.5	138° 42'.8	46'.6
14	13° 28'.9	32° 00'.6	21'.0	17° 56'.6	48'.9	306° 56'.3	12'.6	153° 45'.4	46'.5
15	28° 31'.4	47° 00'.1	19'.8	32° 57'.3	48'.1	321° 58'.5	12'.6	168° 47'.9	46'.5
16	43° 33'.8	61° 59'.7	18'.7	47° 57'.9	47'.3	337° 00'.7	12'.7	183° 50'.4	46'.5
17	58° 36'.3	76° 59'.2	17'.5	62° 58'.6	46'.5	352° 02'.9	12'.7	198° 52'.9	46'.4
18	73° 38'.7	91° 58'.7	16'.4	77° 59'.3	45'.7	7° 05'.1	12'.8	213° 55'.5	46'.4
19	88° 41'.2	106° 58'.2	15'.2	93° 00'.0	44'.9	22° 07'.3	12'.8	228° 58'.0	46'.4
20	103° 43'.7	121° 57'.8	14'.0	108° 00'.7	44'.2	37° 09'.4	12'.9	244° 00'.5	46'.4
21	118° 46'.1	136° 57'.3	12'.9	123° 01'.3	43'.4	52° 11'.6	12'.9	259° 03'.0	46'.3
22	133° 48'.6	151° 56'.8	11'.7	138° 02'.0	42'.6	67° 13'.8	13'.0	274° 05'.6	46'.3
23	148° 51'.1	166° 56'.4	10'.6	153° 02'.7	41'.8	82° 16'.0	13'.0	289° 08'.1	46'.3
6 Wednesday 00	163° 53'.5	181° 55'.9	9° 09'.4 S	168° 03'.4	2° 41'.0 S	97° 18'.2	21° 13'.1 N	304° 10'.6	12° 46'.3 S
01	178° 56'.0	196° 55'.4	08'.3	183° 04'.0	40'.2	112° 20'.3	13'.1	319° 13'.1	46'.2
02	193° 58'.5	211° 54'.9	07'.1	198° 04'.7	39'.4	127° 22'.5	13'.2	334° 15'.7	46'.2
03	209° 00'.9	226° 54'.5	05'.9	213° 05'.4	38'.6	142° 24'.7	13'.2	349° 18'.2	46'.2
04	224° 03'.4	241° 54'.0	04'.8	228° 06'.1	37'.8	157° 26'.9	13'.3	4° 20'.7	46'.1
05	239° 05'.9	256° 53'.5	03'.6	243° 06'.8	37'.0	172° 29'.1	13'.3	19° 23'.2	46'.1
06	254° 08'.3	271° 53'.1	02'.4	258° 07'.4	36'.2	187° 31'.2	13'.4	34° 25'.8	46'.1
07	269° 10'.8	286° 52'.6	01'.3	273° 08'.1	35'.4	202° 33'.4	13'.4	49° 28'.3	46'.1
08	284° 13'.2	301° 52'.1	00'.1	288° 08'.8	34'.6	217° 35'.6	13'.5	64° 30'.8	46'.0
09	299° 15'.7	316° 51'.7	8° 59'.0 S	303° 09'.5	33'.8	232° 37'.8	13'.5	79° 33'.3	46'.0
10	314° 18'.2	331° 51'.2	57'.8	318° 10'.2	33'.0	247° 40'.0	13'.6	94° 35'.9	46'.0
11	329° 20'.6	346° 50'.7	56'.6	333° 10'.8	32'.2	262° 42'.1	13'.6	109° 38'.4	45'.9
12	344° 23'.1	1° 50'.3	8° 55'.5 S	348° 11'.5	2° 31'.5 S	277° 44'.3	21° 13'.7 N	124° 40'.9	12° 45'.9 S
13	359° 25'.6	16° 49'.8	54'.3	3° 12'.2	30'.7	292° 46'.5	13'.7	139° 43'.4	45'.9
14	14° 28'.0	31° 49'.3	53'.1	18° 12'.9	29'.9	307° 48'.7	13'.8	154° 46'.0	45'.9
15	29° 30'.5	46° 48'.9	52'.0	33° 13'.5	29'.1	322° 50'.9	13'.8	169° 48'.5	45'.8
16	44° 33'.0	61° 48'.4	50'.8	48° 14'.2	28'.3	337° 53'.0	13'.9	184° 51'.0	45'.8
17	59° 35'.4	76° 47'.9	49'.6	63° 14'.9	27'.5	352° 55'.2	13'.9	199° 53'.5	45'.8
18	74° 37'.9	91° 47'.5	48'.5	78° 15'.6	26'.7	7° 57'.4	14'.0	214° 56'.1	45'.7
19	89° 40'.4	106° 47'.0	47'.3	93° 16'.3	25'.9	22° 59'.6	14'.0	229° 58'.6	45'.7
20	104° 42'.8	121° 46'.6	46'.1	108° 16'.9	25'.1	38° 01'.7	14'.1	245° 01'.1	45'.7
21	119° 45'.3	136° 46'.1	45'.0	123° 17'.6	24'.3	53° 03'.9	14'.1	260° 03'.7	45'.6
22	134° 47'.7	151° 45'.6	43'.8	138° 18'.3	23'.5	68° 06'.1	14'.2	275° 06'.2	45'.6
23	149° 50'.2	166° 45'.2	42'.6	153° 19'.0	22'.7	83° 08'.3	14'.3	290° 08'.7	45'.6
7 Thursday 00	164° 52'.7	181° 44'.7	8° 41'.5 S	168° 19'.7	2° 21'.9 S	98° 10'.4	21° 14'.3 N	305° 11'.2	12° 45'.6 S
01	179° 55'.1	196° 44'.2	40'.3	183° 20'.3	21'.1	113° 12'.6	14'.4	320° 13'.8	45'.5
02	194° 57'.6	211° 43'.8	39'.1	198° 21'.0	20'.3	128° 14'.8	14'.4	335° 16'.3	45'.5
03	210° 00'.1	226° 43'.3	38'.0	213° 21'.7	19'.5	143° 17'.0	14'.5	350° 18'.8	45'.5
04	225° 02'.5	241° 42'.9	36'.8	228° 22'.4	18'.8	158° 19'.1	14'.5	5° 21'.4	45'.4
05	240° 05'.0	256° 42'.4	35'.6	243° 23'.1	18'.0	173° 21'.3	14'.6	20° 23'.9	45'.4
06	255° 07'.5	271° 41'.9	34'.4	258° 23'.7	17'.2	188° 23'.5	14'.6	35° 26'.4	45'.4
07	270° 09'.9	286° 41'.5	33'.3	273° 24'.4	16'.4	203° 25'.6	14'.7	50° 28'.9	45'.3
08	285° 12'.4	301° 41'.0	32'.1	288° 25'.1	15'.6	218° 27'.8	14'.7	65° 31'.5	45'.3
09	300° 14'.8	316° 40'.6	30'.9	303° 25'.8	14'.8	233° 30'.0	14'.8	80° 34'.0	45'.3
10	315° 17'.3	331° 40'.1	29'.8	318° 26'.5	14'.0	248° 32'.2	14'.8	95° 36'.5	45'.3
11	330° 19'.8	346° 39'.6	28'.6	333° 27'.1	13'.2	263° 34'.3	14'.9	110° 39'.1	45'.2
12	345° 22'.2	1° 39'.2	8° 27'.4 S	348° 27'.8	2° 12'.4 S	278° 36'.5	21° 14'.9 N	125° 41'.6	12° 45'.2 S
13	0° 24'.7	16° 38'.7	26'.2	3° 28'.5	11'.6	293° 38'.7	15'.0	140° 44'.1	45'.2
14	15° 27'.2	31° 38'.3	25'.1	18° 29'.2	10'.8	308° 40'.8	15'.0	155° 46'.7	45'.1
15	30° 29'.6	46° 37'.8	23'.9	33° 29'.9	10'.0	323° 43'.0	15'.1	170° 49'.2	45'.1
16	45° 32'.1	61° 37'.4	22'.7	48° 30'.6	09'.2	338° 45'.2	15'.1	185° 51'.7	45'.1
17	60° 34'.6	76° 36'.9	21'.5	63° 31'.2	08'.4	353° 47'.4	15'.2	200° 54'.2	45'.0
18	75° 37'.0	91° 36'.4	20'.4	78° 31'.9	07'.6	8° 49'.5	15'.2	215° 56'.8	45'.0
19	90° 39'.5	106° 36'.0	19'.2	93° 32'.6	06'.8	23° 51'.7	15'.3	230° 59'.3	45'.0
20	105° 42'.0	121° 35'.5	18'.0	108° 33'.3	06'.0	38° 53'.9	15'.3	246° 01'.8	45'.0
21	120° 44'.4	136° 35'.1	16'.8	123° 34'.0	05'.3	53° 56'.0	15'.4	261° 04'.4	44'.9
22	135° 46'.9	151° 34'.6	15'.6	138° 34'.6	04'.5	68° 58'.2	15'.4	276° 06'.9	44'.9
23	150° 49'.3	166° 34'.2	14'.5	153° 35'.3	03'.7	84° 00'.4	15'.5	291° 09'.4	44'.9
	M.P. 13:02	v -0'.5	d 1'.2	v 0'.7	d 0'.8	v 2'.2	d 0'.1	v 2'.5	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.7	40° 15'.4 S
Achernar	335° 27'.4	57° 10'.4 S
Acrux	173° 08'.8	63° 10'.4 S
Adhara	255° 12'.5	28° 59'.8 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.0 N
Alkaid	152° 58'.7	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.7 S
Alnilam	275° 46'.5	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.6	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.2 S
Antares	112° 26'.4	26° 27'.5 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.4	69° 02'.7 S
Avior	234° 17'.6	59° 33'.5 S
Bellatrix	278° 32'.1	6° 21'.5 N
Betelgeuse	271° 01'.4	7° 24'.3 N
Canopus	263° 56'.0	52° 42'.6 S
Capella	280° 34'.7	46° 00'.7 N
Deneb	49° 31'.9	45° 19'.6 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 55'.0 S
Dubhe	193° 51'.3	61° 40'.6 N
Elnath	278° 12'.8	28° 37'.0 N
Eltanin	90° 46'.3	51° 29'.0 N
Enif	33° 47'.6	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.5	57° 11'.3 S
Gienah	175° 52'.2	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.1 S
Hamal	328° 01'.2	23° 31'.5 N
Kaus Aust.	83° 44'.2	34° 22'.5 S
Kochab	137° 19'.4	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.5	36° 26'.1 S
Miaplacidus	221° 38'.8	69° 46'.6 S
Mirfak	308° 40'.8	49° 54'.6 N
Nunki	75° 58'.7	26° 16'.6 S
Peacock	53° 20'.0	56° 41'.3 S
Polaris	318° 05'.9	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.7	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.2	8° 11'.5 S
Rigil Kent	139° 51'.5	60° 53'.2 S
Sabik	102° 12'.8	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.7 N
Shaula	96° 22'.2	37° 06'.6 S
Sirius	258° 33'.7	16° 44'.4 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.5 S
Vega	80° 39'.2	38° 47'.6 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	18° 02'.4	11:53
Mars	4° 09'.8	12:47
Jupiter	293° 24'.6	17:28
Saturn	140° 17'.1	03:43

SUN	GHA	Dec
5	177° 07'.0	6° 04'.4 S
6	192° 07'.1	03'.4
7	207° 07'.3	02'.5
	222° 07'.4	01'.5
	237° 07'.6	00'.5
	252° 07'.7	5° 59'.6 S
	267° 07'.8	58'.6
	282° 08'.0	57'.6
	297° 08'.1	56'.7
	312° 08'.3	55'.7
	327° 08'.4	54'.7
	342° 08'.5	53'.8
	357° 08'.7	5° 52'.8 S
	12° 08'.8	51'.8
	27° 09'.0	50'.9
	42° 09'.1	49'.9
	57° 09'.3	48'.9
	72° 09'.4	48'.0
	87° 09'.5	47'.0
	102° 09'.7	46'.0
	117° 09'.8	45'.1
	132° 10'.0	44'.1
	147° 10'.1	43'.1
	162° 10'.3	42'.1
	177° 10'.4	5° 41'.2 S
	192° 10'.6	40'.2
	207° 10'.7	39'.2
	222° 10'.8	38'.3
	237° 11'.0	37'.3
	252° 11'.1	36'.3
	267° 11'.3	35'.4
	282° 11'.4	34'.4
	297° 11'.6	33'.4
	312° 11'.7	32'.5
	327° 11'.9	31'.5
	342° 12'.0	30'.5
	357° 12'.2	5° 29'.5 S
	12° 12'.3	28'.6
	27° 12'.4	27'.6
	42° 12'.6	26'.6
	57° 12'.7	25'.7
	72° 12'.9	24'.7
	87° 13'.0	23'.7
	102° 13'.2	22'.7
	117° 13'.3	21'.8
	132° 13'.5	20'.8
	147° 13'.6	19'.8
	162° 13'.8	18'.9
	177° 13'.9	5° 17'.9 S
	192° 14'.1	16'.9
	207° 14'.2	15'.9
	222° 14'.4	15'.0
	237° 14'.5	14'.0
	252° 14'.7	13'.0
	267° 14'.8	12'.0
	282° 15'.0	11'.1
	297° 15'.1	10'.1
	312° 15'.3	09'.1
	327° 15'.4	08'.2
	342° 15'.6	07'.2
	357° 15'.7	5° 06'.2 S
	12° 15'.9	05'.2
	27° 16'.0	04'.3
	42° 16'.2	03'.3
	57° 16'.3	02'.3
	72° 16'.5	01'.3
	87° 16'.6	00'.4
	102° 16'.8	4° 59'.4 S
	117° 16'.9	58'.4
	132° 17'.1	57'.4
	147° 17'.2	56'.5
	162° 17'.4	55'.5
SD	16'.1	d 1'.0

MOON	GHA	v	Dec	d	HP
5	268° 08'.5	5'.7	20° 24'.1 S	0'.8	59'.2
6	282° 33'.2	5'.8	24'.9	0'.7	
7	296° 58'.0	5'.7	25'.6	0'.6	
	311° 22'.7	5'.7	26'.2	0'.4	
	325° 47'.4	5'.7	26'.6	0'.3	
	340° 12'.1	5'.7	26'.9	0'.1	
	354° 36'.8	5'.7	27'.0	0'.1	
	9° 01'.5	5'.7	27'.1	0'.1	59'.3
	23° 26'.2	5'.7	27'.0	0'.3	
	37° 50'.9	5'.7	26'.7	0'.4	
	52° 15'.6	5'.7	26'.3	0'.5	
	66° 40'.3	5'.7	25'.8	0'.7	
	81° 05'.0	5'.7	20° 25'.1 S	0'.8	59'.3
	95° 29'.7	5'.7	24'.3	0'.9	
	109° 54'.4	5'.8	23'.4	1'.1	
	124° 19'.2	5'.7	22'.3	1'.2	
	138° 43'.9	5'.7	21'.1	1'.3	
	153° 08'.6	5'.7	19'.8	1'.5	
	167° 33'.3	5'.8	18'.3	1'.6	
	181° 58'.1	5'.8	16'.7	1'.7	
	196° 22'.9	5'.7	15'.0	1'.9	
	210° 47'.6	5'.8	13'.1	2'.0	
	225° 12'.4	5'.8	11'.1	2'.1	
	239° 37'.2	5'.8	09'.0	2'.3	
	254° 02'.0	5'.9	20° 06'.7 S	2'.4	59'.3
	268° 26'.9	5'.8	04'.3	2'.6	
	282° 51'.7	5'.9	01'.7	2'.6	
	297° 16'.6	5'.9	19° 59'.1 S	2'.8	
	311° 41'.5	5'.9	56'.3	3'.0	
	326° 06'.4	6'.0	53'.3	3'.0	
	340° 31'.4	5'.9	50'.3	3'.2	
	354° 56'.3	6'.0	47'.1	3'.4	
	9° 21'.3	6'.0	43'.7	3'.4	
	23° 46'.3	6'.1	40'.3	3'.6	
	38° 11'.4	6'.0	36'.7	3'.7	
	52° 36'.4	6'.1	33'.0	3'.9	
	67° 01'.5	6'.2	19° 29'.1 S	3'.9	59'.3
	81° 26'.7	6'.1	25'.2	4'.1	
	95° 51'.8	6'.2	21'.1	4'.2	
	110° 17'.0	6'.3	16'.9	4'.4	
	124° 42'.3	6'.2	12'.5	4'.5	59'.2
	139° 07'.5	6'.3	08'.0	4'.6	
	153° 32'.8	6'.4	03'.4	4'.7	
	167° 58'.2	6'.3	18° 58'.7 S	4'.8	
	182° 23'.5	6'.4	53'.9	5'.0	
	196° 48'.9	6'.5	48'.9	5'.1	
	211° 14'.4	6'.5	43'.8	5'.2	
	225° 39'.9	6'.5	38'.6	5'.3	
	240° 05'.4	6'.6	18° 33'.3 S	5'.5	59'.2
	254° 31'.0	6'.6	27'.8	5'.5	
	268° 56'.6	6'.7	22'.3	5'.7	
	283° 22'.3	6'.7	16'.6	5'.8	
	297° 48'.0	6'.7	10'.8	5'.9	
	312° 13'.7	6'.8	04'.9	6'.1	
	326° 39'.5	6'.8	17° 58'.8 S	6'.1	
	341° 05'.3	6'.9	52'.7	6'.3	
	355° 31'.2	6'.9	46'.4	6'.3	
	9° 57'.1	7'.0	40'.1	6'.5	
	24° 23'.1	7'.0	33'.6	6'.6	
	38° 49'.1	7'.1	27'.0	6'.7	
	53° 15'.2	7'.1	17° 20'.3 S	6'.8	59'.2
	67° 41'.3	7'.2	13'.5	6'.9	
	82° 07'.5	7'.2	06'.6	7'.0	
	96° 33'.7	7'.3	16° 59'.6 S	7'.2	59'.1
	111° 00'.0	7'.3	52'.4	7'.2	
	125° 26'.3	7'.4	45'.2	7'.3	
	139° 52'.7	7'.4	37'.9	7'.5	
	154° 19'.1	7'.5	30'.4	7'.5	
	168° 45'.6	7'.5	22'.9	7'.6	
	183° 12'.1	7'.6	15'.3	7'.8	
	197° 38'.7	7'.7	07'.5	7'.8	
	212° 05'.4	7'.7	15° 59'.7 S	8'.0	
SD	16'.1		16'.1		16'.1

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 5	Moonrise 6	Moonrise 7
N 72°	04:43	06:02	07:10	-	-	07:57
N 70°	04:52	06:02	07:03	-	07:01	06:30
68°	04:58	06:03	06:58	04:53	05:34	05:50
66°	05:03	06:02	06:53	04:07	04:56	05:22
64°	05:07	06:02	06:50	03:38	04:28	05:01
62°	05:11	06:02	06:46	03:15	04:07	04:44
60°	05:14	06:02	06:43	02:57	03:50	04:30
N 58°	05:16	06:02	06:41	02:42	03:36	04:17
56°	05:18	06:01	06:39	02:29	03:24	04:07
54°	05:20	06:01	06:36	02:17	03:13	03:57
52°	05:22	06:01	06:35	02:08	03:03	03:49
50°	05:23	06:01	06:33	01:59	02:55	03:42
45°	05:26	06:00	06:29	01:40	02:36	03:25
N 40°	05:27	05:59	06:26	01:24	02:21	03:12
35°	05:28	05:58	06:23	01:11	02:09	03:01
30°	05:29	05:56	06:20	01:00	01:58	02:51
20°	05:28	05:54	06:16	00:41	01:39	02:34
N 10°	05:26	05:51	06:12	00:24	01:23	02:19
0°	05:23	05:47	06:08	00:08	01:07	02:05
S 10°	05:18	05:43	06:04	-	00:52	01:51
20°	05:11	05:37	06:00	-	00:35	01:36
30°	05:02	05:30	05:54	-	00:16	01:19
35°	04:56	05:26	05:51	-	00:05	01:09
40°	04:48	05:21	05:48	23:53	-	00:58
45°	04:39	05:14	05:44	23:38	-	00:44
S 50°	04:26	05:06	05:39	23:20	-	00:28
52°	04:20	05:02	05:37	23:11	-	00:20
54°	04:14	04:58	05:34	23:02	-	00:11
56°	04:06	04:53	05:32	22:51	-	00:02
58°	03:57	04:48	05:29	22:38	23:51	25:11
S 60°	03:47	04:42	05:25	22:24	23:38	25:01
S 62°	03:35	04:35	05:21	22:06	23:23	24:49

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 5	Moonset 6	Moonset 7
N 72°	17:15	18:22	19:42	-	-	08:52
N 70°	17:21	18:22	19:34	-	07:47	10:19
68°	17:26	18:22	19:27	07:52	09:13	10:58
66°	17:30	18:22	19:21	08:37	09:51	11:24
64°	17:34	18:22	19:17	09:07	10:18	11:45
62°	17:37	18:22	19:13	09:30	10:39	12:02
60°	17:40	18:22	19:10	09:48	10:56	12:15
N 58°	17:43	18:22	19:07	10:03	11:10	12:27
56°	17:45	18:22	19:05	10:16	11:22	12:37
54°	17:47	18:22	19:03	10:27	11:33	12:46
52°	17:49	18:23	19:02	10:37	11:42	12:54
50°	17:51	18:23	19:00	10:46	11:51	13:02
45°	17:54	18:24	18:58	11:05	12:08	13:17
N 40°	17:57	18:24	18:56	11:20	12:23	13:29
35°	18:00	18:25	18:55	11:33	12:35	13:40
30°	18:03	18:26	18:54	11:45	12:46	13:49
20°	18:07	18:29	18:54	12:04	13:04	14:05
N 10°	18:11	18:32	18:56	12:21	13:20	14:19
0°	18:14	18:35	18:59	12:36	13:35	14:32
S 10°	18:18	18:39	19:04	12:52	13:50	14:45
20°	18:23	18:45	19:11	13:09	14:05	14:59
30°	18:27	18:52	19:20	13:28	14:23	15:14
35°	18:30	18:56	19:26	13:39	14:34	15:23
40°	18:34	19:01	19:33	13:52	14:46	15:33
45°	18:38	19:07	19:43	14:07	15:00	15:45
S 50°	18:42	19:15	19:55	14:25	15:17	16:00
52°	18:44	19:19	20:00	14:34	15:25	16:06
54°	18:47	19:23	20:07	14:44	15:34	16:14
56°	18:49	19:28	20:14	14:55	15:44	16:22
58°	18:52	19:33	20:23	15:07	15:55	16:31
S 60°	18:55	19:39	20:33	15:22	16:08	16:42
S 62°	18:59	19:46	20:45	15:39	16:24	16:54

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
5	11 32	11 26	12:11	06:22	18:52	23d 43%
6	11 19	11 12	12:11	07:21	19:50	24d 32%
7	11 05	10 57	12:11	08:19	20:47	25d 22%

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2013 March 8, 9, 10 (Fri, Sat, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.2		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
8 Friday 00	165° 51'.8	181° 33'.7	8° 13'.3 S	168° 36'.0	2° 02'.9 S	99° 02'.5	21° 15'.5 N	306° 12'.0	12° 44'.8 S
01	180° 54'.3	196° 33'.3	12'.1	183° 36'.7	02'.1	114° 04'.7	15'.6	321° 14'.5	44'.8
02	195° 56'.7	211° 32'.8	10'.9	198° 37'.4	01'.3	129° 06'.9	15'.6	336° 17'.0	44'.8
03	210° 59'.2	226° 32'.4	09'.8	213° 38'.1	00'.5	144° 09'.0	15'.7	351° 19'.6	44'.7
04	226° 01'.7	241° 31'.9	08'.6	228° 38'.7	1° 59'.7 S	159° 11'.2	15'.7	6° 22'.1	44'.7
05	241° 04'.1	256° 31'.4	07'.4	243° 39'.4	58'.9	174° 13'.4	15'.8	21° 24'.6	44'.7
06	256° 06'.6	271° 31'.0	06'.2	258° 40'.1	58'.1	189° 15'.5	15'.9	36° 27'.2	44'.7
07	271° 09'.1	286° 30'.5	05'.0	273° 40'.8	57'.3	204° 17'.7	15'.9	51° 29'.7	44'.6
08	286° 11'.5	301° 30'.1	03'.8	288° 41'.5	56'.5	219° 19'.9	16'.0	66° 32'.2	44'.6
09	301° 14'.0	316° 29'.6	02'.7	303° 42'.1	55'.7	234° 22'.0	16'.0	81° 34'.8	44'.6
10	316° 16'.5	331° 29'.2	01'.5	318° 42'.8	54'.9	249° 24'.2	16'.1	96° 37'.3	44'.5
11	331° 18'.9	346° 28'.7	00'.3	333° 43'.5	54'.1	264° 26'.4	16'.1	111° 39'.8	44'.5
12	346° 21'.4	1° 28'.3	7° 59'.1 S	348° 44'.2	1° 53'.3 S	279° 28'.5	21° 16'.2 N	126° 42'.4	12° 44'.5 S
13	1° 23'.8	16° 27'.8	57'.9	3° 44'.9	52'.5	294° 30'.7	16'.2	141° 44'.9	44'.4
14	16° 26'.3	31° 27'.4	56'.7	18° 45'.6	51'.7	309° 32'.9	16'.3	156° 47'.4	44'.4
15	31° 28'.8	46° 26'.9	55'.6	33° 46'.2	51'.0	324° 35'.0	16'.3	171° 50'.0	44'.4
16	46° 31'.2	61° 26'.5	54'.4	48° 46'.9	50'.2	339° 37'.2	16'.4	186° 52'.5	44'.3
17	61° 33'.7	76° 26'.0	53'.2	63° 47'.6	49'.4	354° 39'.3	16'.4	201° 55'.0	44'.3
18	76° 36'.2	91° 25'.6	52'.0	78° 48'.3	48'.6	9° 41'.5	16'.5	216° 57'.6	44'.3
19	91° 38'.6	106° 25'.1	50'.8	93° 49'.0	47'.8	24° 43'.7	16'.5	232° 00'.1	44'.2
20	106° 41'.1	121° 24'.7	49'.6	108° 49'.7	47'.0	39° 45'.8	16'.6	247° 02'.6	44'.2
21	121° 43'.6	136° 24'.3	48'.5	123° 50'.3	46'.2	54° 48'.0	16'.6	262° 05'.2	44'.2
22	136° 46'.0	151° 23'.8	47'.3	138° 51'.0	45'.4	69° 50'.2	16'.7	277° 07'.7	44'.1
23	151° 48'.5	166° 23'.4	46'.1	153° 51'.7	44'.6	84° 52'.3	16'.7	292° 10'.3	44'.1
9 Saturday 00	166° 50'.9	181° 22'.9	7° 44'.9 S	168° 52'.4	1° 43'.8 S	99° 54'.5	21° 16'.8 N	307° 12'.8	12° 44'.1 S
01	181° 53'.4	196° 22'.5	43'.7	183° 53'.1	43'.0	114° 56'.6	16'.9	322° 15'.3	44'.1
02	196° 55'.9	211° 22'.0	42'.5	198° 53'.8	42'.2	129° 58'.8	16'.9	337° 17'.9	44'.0
03	211° 58'.3	226° 21'.6	41'.3	213° 54'.4	41'.4	145° 01'.0	17'.0	352° 20'.4	44'.0
04	227° 00'.8	241° 21'.1	40'.1	228° 55'.1	40'.6	160° 03'.1	17'.0	7° 22'.9	44'.0
05	242° 03'.3	256° 20'.7	38'.9	243° 55'.8	39'.8	175° 05'.3	17'.1	22° 25'.5	43'.9
06	257° 05'.7	271° 20'.2	37'.8	258° 56'.5	39'.0	190° 07'.4	17'.1	37° 28'.0	43'.9
07	272° 08'.2	286° 19'.8	36'.6	273° 57'.2	38'.2	205° 09'.6	17'.2	52° 30'.5	43'.9
08	287° 10'.7	301° 19'.4	35'.4	288° 57'.9	37'.5	220° 11'.7	17'.2	67° 33'.1	43'.8
09	302° 13'.1	316° 18'.9	34'.2	303° 58'.5	36'.7	235° 13'.9	17'.3	82° 35'.6	43'.8
10	317° 15'.6	331° 18'.5	33'.0	318° 59'.2	35'.9	250° 16'.1	17'.3	97° 38'.2	43'.8
11	332° 18'.1	346° 18'.0	31'.8	333° 59'.9	35'.1	265° 18'.2	17'.4	112° 40'.7	43'.7
12	347° 20'.5	1° 17'.6	7° 30'.6 S	349° 00'.6	1° 34'.3 S	280° 20'.4	21° 17'.4 N	127° 43'.2	12° 43'.7 S
13	2° 23'.0	16° 17'.1	29'.4	4° 01'.3	33'.5	295° 22'.5	17'.5	142° 45'.8	43'.7
14	17° 25'.4	31° 16'.7	28'.2	19° 02'.0	32'.7	310° 24'.7	17'.5	157° 48'.3	43'.6
15	32° 27'.9	46° 16'.3	27'.0	34° 02'.7	31'.9	325° 26'.8	17'.6	172° 50'.8	43'.6
16	47° 30'.4	61° 15'.8	25'.8	49° 03'.3	31'.1	340° 29'.0	17'.6	187° 53'.4	43'.6
17	62° 32'.8	76° 15'.4	24'.7	64° 04'.0	30'.3	355° 31'.2	17'.7	202° 55'.9	43'.5
18	77° 35'.3	91° 14'.9	23'.5	79° 04'.7	29'.5	10° 33'.3	17'.8	217° 58'.5	43'.5
19	92° 37'.8	106° 14'.5	22'.3	94° 05'.4	28'.7	25° 35'.5	17'.8	233° 01'.0	43'.5
20	107° 40'.2	121° 14'.0	21'.1	109° 06'.1	27'.9	40° 37'.6	17'.9	248° 03'.5	43'.4
21	122° 42'.7	136° 13'.6	19'.9	124° 06'.8	27'.1	55° 39'.8	17'.9	263° 06'.1	43'.4
22	137° 45'.2	151° 13'.2	18'.7	139° 07'.4	26'.3	70° 41'.9	18'.0	278° 08'.6	43'.4
23	152° 47'.6	166° 12'.7	17'.5	154° 08'.1	25'.5	85° 44'.1	18'.0	293° 11'.2	43'.3
10 Sunday 00	167° 50'.1	181° 12'.3	7° 16'.3 S	169° 08'.8	1° 24'.7 S	100° 46'.2	21° 18'.1 N	308° 13'.7	12° 43'.3 S
01	182° 52'.6	196° 11'.9	15'.1	184° 09'.5	24'.0	115° 48'.4	18'.1	323° 16'.2	43'.3
02	197° 55'.0	211° 11'.4	13'.9	199° 10'.2	23'.2	130° 50'.6	18'.2	338° 18'.8	43'.2
03	212° 57'.5	226° 11'.0	12'.7	214° 10'.9	22'.4	145° 52'.7	18'.2	353° 21'.3	43'.2
04	227° 59'.9	241° 10'.5	11'.5	229° 11'.6	21'.6	160° 54'.9	18'.3	8° 23'.9	43'.2
05	243° 02'.4	256° 10'.1	10'.3	244° 12'.2	20'.8	175° 57'.0	18'.3	23° 26'.4	43'.1
06	258° 04'.9	271° 09'.7	09'.1	259° 12'.9	20'.0	190° 59'.2	18'.4	38° 28'.9	43'.1
07	273° 07'.3	286° 09'.2	07'.9	274° 13'.6	19'.2	206° 01'.3	18'.4	53° 31'.5	43'.1
08	288° 09'.8	301° 08'.8	06'.7	289° 14'.3	18'.4	221° 03'.5	18'.5	68° 34'.0	43'.0
09	303° 12'.3	316° 08'.4	05'.5	304° 15'.0	17'.6	236° 05'.6	18'.6	83° 36'.6	43'.0
10	318° 14'.7	331° 07'.9	04'.3	319° 15'.7	16'.8	251° 07'.8	18'.6	98° 39'.1	43'.0
11	333° 17'.2	346° 07'.5	03'.1	334° 16'.4	16'.0	266° 09'.9	18'.7	113° 41'.7	42'.9
12	348° 19'.7	1° 07'.0	7° 01'.9 S	349° 17'.0	1° 15'.2 S	281° 12'.1	21° 18'.7 N	128° 44'.2	12° 42'.9 S
13	3° 22'.1	16° 06'.6	00'.7	4° 17'.7	14'.4	296° 14'.2	18'.8	143° 46'.7	42'.9
14	18° 24'.6	31° 06'.2	6° 59'.5 S	19° 18'.4	13'.6	311° 16'.4	18'.8	158° 49'.3	42'.8
15	33° 27'.0	46° 05'.7	58'.3	34° 19'.1	12'.8	326° 18'.5	18'.9	173° 51'.8	42'.8
16	48° 29'.5	61° 05'.3	57'.1	49° 19'.8	12'.0	341° 20'.7	18'.9	188° 54'.4	42'.8
17	63° 32'.0	76° 04'.9	55'.9	64° 20'.5	11'.2	356° 22'.8	19'.0	203° 56'.9	42'.7
18	78° 34'.4	91° 04'.4	54'.7	79° 21'.2	10'.5	11° 25'.0	19'.0	218° 59'.5	42'.7
19	93° 36'.9	106° 04'.0	53'.5	94° 21'.8	09'.7	26° 27'.1	19'.1	234° 02'.0	42'.7
20	108° 39'.4	121° 03'.6	52'.3	109° 22'.5	08'.9	41° 29'.3	19'.1	249° 04'.5	42'.6
21	123° 41'.8	136° 03'.1	51'.1	124° 23'.2	08'.1	56° 31'.4	19'.2	264° 07'.1	42'.6
22	138° 44'.3	151° 02'.7	49'.9	139° 23'.9	07'.3	71° 33'.6	19'.3	279° 09'.6	42'.6
23	153° 46'.8	166° 02'.3	48'.7	154° 24'.6	06'.5	86° 35'.7	19'.3	294° 12'.2	42'.5
	M.P. 12:50	v -0'.4	d 1'.2	v 0'.7	d 0'.8	v 2'.2	d 0'.1	v 2'.5	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.7	40° 15'.4 S
Achernar	335° 27'.4	57° 10'.4 S
Acrux	173° 08'.8	63° 10'.4 S
Adhara	255° 12'.5	28° 59'.8 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.0 N
Alkaid	152° 58'.7	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.7 S
Alnilam	275° 46'.5	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.6	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.2 S
Antares	112° 26'.4	26° 27'.5 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.3	69° 02'.7 S
Avior	234° 17'.6	59° 33'.5 S
Bellatrix	278° 32'.2	6° 21'.5 N
Betelgeuse	271° 01'.4	7° 24'.3 N
Canopus	263° 56'.1	52° 42'.6 S
Capella	280° 34'.7	46° 00'.7 N
Deneb	49° 31'.9	45° 19'.6 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 55'.0 S
Dubhe	193° 51'.3	61° 40'.6 N
Elnath	278° 12'.8	28° 37'.0 N
Eltanin	90° 46'.3	51° 29'.0 N
Enif	33° 47'.6	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.5	57° 11'.3 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.1 S
Hamal	328° 01'.2	23° 31'.5 N
Kaus Aust.	83° 44'.1	34° 22'.5 S
Kochab	137° 19'.4	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.5	36° 26'.1 S
Miaplacidus	221° 38'.9	69° 46'.6 S
Mirfak	308° 40'.8	49° 54'.5 N
Nunki	75° 58'.7	26° 16'.6 S
Peacock	53° 19'.9	56° 41'.3 S
Polaris	318° 07'.1	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.6	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.2	8° 11'.5 S
Rigil Kent	139° 51'.5	60° 53'.2 S
Sabik	102° 12'.7	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.7 N
Shaula	96° 22'.2	37° 06'.6 S
Sirius	258° 33'.7	16° 44'.4 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.5 S
Vega	80° 39'.2	38° 47'.6 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	14° 32'.0	11:55
Mars	2° 01'.4	12:44
Jupiter	293° 03'.5	17:18
Saturn	140° 21'.8	03:31

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP
177° 17'.5	4° 54'.5 S	226° 32'.1	7'.7	15° 51'.7 S	8'.0	59'.1
192° 17'.7	53'.5	240° 58'.8	7'.8	43'.7	8'.1	
207° 17'.8	52'.6	255° 25'.6	7'.9	35'.6	8'.2	
222° 18'.0	51'.6	269° 52'.5	7'.9	27'.4	8'.3	
237° 18'.1	50'.6	284° 19'.4	8'.0	19'.1	8'.4	59'.0
252° 18'.3	49'.6	298° 46'.4	8'.0	10'.7	8'.5	
267° 18'.5	48'.7	313° 13'.4	8'.1	02'.2	8'.6	
282° 18'.6	47'.7	327° 40'.5	8'.1	14° 53'.6 S	8'.7	
297° 18'.8	46'.7	342° 07'.6	8'.2	44'.9	8'.7	
312° 18'.9	45'.7	356° 34'.8	8'.2	36'.2	8'.9	
327° 19'.1	44'.8	11° 02'.0	8'.3	27'.3	8'.9	
342° 19'.2	43'.8	25° 29'.3	8'.4	18'.4	9'.0	
357° 19'.4	4° 42'.8 S	39° 56'.7	8'.4	14° 09'.4 S	9'.1	59'.0
12° 19'.5	41'.8	54° 24'.1	8'.5	00'.3	9'.1	
27° 19'.7	40'.8	68° 51'.6	8'.5	13° 51'.2 S	9'.3	58'.9
42° 19'.8	39'.9	83° 19'.1	8'.6	41'.9	9'.3	
57° 20'.0	38'.9	97° 46'.7	8'.6	32'.6	9'.4	
72° 20'.1	37'.9	112° 14'.3	8'.7	23'.2	9'.5	
87° 20'.3	36'.9	126° 42'.0	8'.8	13'.7	9'.6	
102° 20'.5	36'.0	141° 09'.8	8'.8	04'.1	9'.6	
117° 20'.6	35'.0	155° 37'.6	8'.9	12° 54'.5 S	9'.7	
132° 20'.8	34'.0	170° 05'.5	8'.9	44'.8	9'.8	
147° 20'.9	33'.0	184° 33'.4	9'.0	35'.0	9'.8	
162° 21'.1	32'.1	199° 01'.4	9'.0	25'.2	9'.9	58'.8
177° 21'.2	4° 31'.1 S	213° 29'.4	9'.1	12° 15'.3 S	10'.0	58'.8
192° 21'.4	30'.1	227° 57'.5	9'.1	05'.3	10'.1	
207° 21'.5	29'.1	242° 25'.6	9'.2	11° 55'.2 S	10'.1	
222° 21'.7	28'.1	256° 53'.8	9'.3	45'.1	10'.1	
237° 21'.9	27'.2	271° 22'.1	9'.3	35'.0	10'.3	
252° 22'.0	26'.2	285° 50'.4	9'.4	24'.7	10'.3	
267° 22'.2	25'.2	300° 18'.8	9'.4	14'.4	10'.3	58'.7
282° 22'.3	24'.2	314° 47'.2	9'.5	04'.1	10'.5	
297° 22'.5	23'.3	329° 15'.7	9'.5	10° 53'.6 S	10'.4	
312° 22'.6	22'.3	343° 44'.2	9'.6	43'.2	10'.6	
327° 22'.8	21'.3	358° 12'.8	9'.6	32'.6	10'.5	
342° 23'.0	20'.3	12° 41'.4	9'.7	22'.1	10'.7	
357° 23'.1	4° 19'.3 S	27° 10'.1	9'.7	10° 11'.4 S	10'.7	58'.7
12° 23'.3	18'.4	41° 38'.8	9'.8	00'.7	10'.7	58'.6
27° 23'.4	17'.4	56° 07'.6	9'.9	9° 50'.0 S	10'.8	
42° 23'.6	16'.4	70° 36'.5	9'.9	39'.2	10'.9	
57° 23'.7	15'.4	85° 05'.4	9'.9	28'.3	10'.8	
72° 23'.9	14'.4	99° 34'.3	10'.0	17'.5	11'.0	
87° 24'.1	13'.5	114° 03'.3	10'.1	06'.5	11'.0	
102° 24'.2	12'.5	128° 32'.4	10'.1	8° 55'.5 S	11'.0	58'.5
117° 24'.4	11'.5	143° 01'.5	10'.1	44'.5	11'.1	
132° 24'.5	10'.5	157° 30'.6	10'.2	33'.4	11'.1	
147° 24'.7	09'.5	171° 59'.8	10'.3	22'.3	11'.1	
162° 24'.9	08'.6	186° 29'.1	10'.3	11'.2	11'.2	
177° 25'.0	4° 07'.6 S	200° 58'.4	10'.3	8° 00'.0 S	11'.2	58'.5
192° 25'.2	06'.6	215° 27'.7	10'.4	7° 48'.8 S	11'.3	58'.4
207° 25'.3	05'.6	229° 57'.1	10'.5	37'.5	11'.3	
222° 25'.5	04'.6	244° 26'.6	10'.5	26'.2	11'.3	
237° 25'.7	03'.7	258° 56'.1	10'.5	14'.9	11'.4	
252° 25'.8	02'.7	273° 25'.6	10'.6	03'.5	11'.4	
267° 26'.0	01'.7	287° 55'.2	10'.6	6° 52'.1 S	11'.4	
282° 26'.1	00'.7	302° 24'.8	10'.7	40'.7	11'.4	58'.3
297° 26'.3	3° 59'.7 S	316° 54'.5	10'.7	29'.3	11'.5	
312° 26'.5	58'.8	331° 24'.2	10'.8	17'.8	11'.5	
327° 26'.6	57'.8	345° 54'.0	10'.8	06'.3	11'.6	
342° 26'.8	56'.8	0° 23'.8	10'.8	5° 54'.7 S	11'.5	
357° 26'.9	3° 55'.8 S	14° 53'.6	10'.9	5° 43'.2 S	11'.6	58'.2
12° 27'.1	54'.8	29° 23'.5	11'.0	31'.6	11'.6	
27° 27'.3	53'.9	43° 53'.5	11'.0	20'.0	11'.6	
42° 27'.4	52'.9	58° 23'.5	11'.0	08'.4	11'.7	
57° 27'.6	51'.9	72° 53'.5	11'.0	4° 56'.7 S	11'.6	
72° 27'.8	50'.9	87° 23'.5	11'.1	45'.1	11'.7	58'.1
87° 27'.9	49'.9	101° 53'.6	11'.2	33'.4	11'.7	
102° 28'.1	49'.0	116° 23'.8	11'.1	21'.7	11'.7	
117° 28'.2	48'.0	130° 53'.9	11'.3	10'.0	11'.7	
132° 28'.4	47'.0	145° 24'.2	11'.2	3° 58'.3 S	11'.7	
147° 28'.6	46'.0	159° 54'.4	11'.3	46'.6	11'.8	58'.0
162° 28'.7	45'.0	174° 24'.7	11'.3	34'.8	11'.7	
SD 16'.1	d 1'.0	SD	16'.1	16'.0	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 8	Moonrise 9	Moonrise 10
N 72°	04:27	05:47	06:54	06:53	06:32	06:17
N 70°	04:37	05:49	06:49	06:20	06:13	06:07
68°	04:45	05:50	06:45	05:56	05:58	05:59
66°	04:51	05:51	06:42	05:37	05:46	05:53
64°	04:57	05:52	06:39	05:22	05:36	05:47
62°	05:01	05:53	06:37	05:09	05:28	05:42
60°	05:05	05:53	06:34	04:58	05:20	05:37
N 58°	05:08	05:54	06:33	04:49	05:13	05:34
56°	05:11	05:54	06:31	04:41	05:08	05:30
54°	05:13	05:54	06:29	04:33	05:02	05:27
52°	05:15	05:54	06:28	04:26	04:57	05:24
50°	05:17	05:54	06:26	04:20	04:53	05:22
45°	05:20	05:54	06:23	04:07	04:44	05:16
N 40°	05:23	05:54	06:21	03:57	04:36	05:11
35°	05:24	05:54	06:19	03:47	04:29	05:07
30°	05:25	05:53	06:17	03:39	04:23	05:03
20°	05:26	05:51	06:13	03:25	04:13	04:57
N 10°	05:25	05:49	06:10	03:13	04:04	04:52
0°	05:22	05:46	06:07	03:01	03:55	04:46
S 10°	05:18	05:43	06:04	02:50	03:46	04:41
20°	05:13	05:38	06:01	02:37	03:37	04:36
30°	05:04	05:32	05:56	02:23	03:27	04:29
35°	04:59	05:29	05:54	02:15	03:21	04:26
40°	04:52	05:24	05:51	02:05	03:14	04:21
45°	04:43	05:18	05:48	01:54	03:06	04:17
S 50°	04:32	05:11	05:44	01:41	02:56	04:11
52°	04:27	05:08	05:42	01:34	02:51	04:08
54°	04:21	05:04	05:40	01:27	02:46	04:05
56°	04:14	05:00	05:38	01:20	02:41	04:02
58°	04:06	04:55	05:36	01:11	02:34	03:58
S 60°	03:57	04:50	05:33	01:01	02:27	03:54
S 62°	03:46	04:44	05:30	00:49	02:19	03:50

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 8	Moonset 9	Moonset 10
N 72°	17:29	18:36	19:57	11:53	14:05	16:05
N 70°	17:33	18:34	19:47	12:24	14:21	16:13
68°	17:37	18:33	19:38	12:47	14:35	16:19
66°	17:40	18:32	19:32	13:05	14:45	16:24
64°	17:43	18:31	19:26	13:19	14:54	16:28
62°	17:46	18:30	19:22	13:31	15:02	16:32
60°	17:48	18:29	19:18	13:41	15:08	16:35
N 58°	17:50	18:29	19:14	13:50	15:14	16:38
56°	17:51	18:28	19:12	13:57	15:19	16:40
54°	17:53	18:28	19:09	14:04	15:24	16:42
52°	17:54	18:28	19:07	14:10	15:28	16:44
50°	17:55	18:28	19:05	14:16	15:31	16:46
45°	17:58	18:27	19:02	14:28	15:39	16:50
N 40°	18:01	18:28	18:59	14:38	15:46	16:53
35°	18:03	18:28	18:57	14:46	15:52	16:56
30°	18:04	18:28	18:56	14:53	15:57	16:59
20°	18:08	18:30	18:55	15:06	16:05	17:03
N 10°	18:11	18:32	18:56	15:17	16:13	17:07
0°	18:14	18:34	18:59	15:27	16:20	17:10
S 10°	18:17	18:38	19:02	15:37	16:27	17:14
20°	18:20	18:42	19:08	15:48	16:34	17:17
30°	18:24	18:48	19:16	16:00	16:42	17:21
35°	18:26	18:52	19:22	16:07	16:47	17:24
40°	18:29	18:56	19:28	16:15	16:52	17:26
45°	18:32	19:02	19:37	16:24	16:59	17:29
S 50°	18:36	19:08	19:48	16:35	17:06	17:33
52°	18:38	19:12	19:53	16:41	17:09	17:35
54°	18:39	19:15	19:59	16:46	17:13	17:36
56°	18:41	19:19	20:05	16:52	17:17	17:38
58°	18:44	19:24	20:13	16:59	17:22	17:40
S 60°	18:46	19:29	20:22	17:07	17:27	17:43
S 62°	18:49	19:35	20:33	17:16	17:32	17:46

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
8	10 50	10 43	12:11	09:14	21:41	26d 14%
9	10 35	10 28	12:10	10:07	22:33	27d 7%
10	10 20	10 13	12:10	10:58	23:23	28d 2%

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2013 March 11, 12, 13 (Mon, Tue, Wed)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.2		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
11 Monday 00	168° 49'.2	181° 01'.8	6° 47'.5 S	169° 25'.3	1° 05'.7 S	101° 37'.9	21° 19'.4 N	309° 14'.7	12° 42'.5 S
01	183° 51'.7	196° 01'.4	46'.3	184° 26'.0	04'.9	116° 40'.0	19'.4	324° 17'.3	42'.5
02	198° 54'.2	211° 01'.0	45'.1	199° 26'.7	04'.1	131° 42'.1	19'.5	339° 19'.8	42'.4
03	213° 56'.6	226° 00'.5	43'.9	214° 27'.3	03'.3	146° 44'.3	19'.5	354° 22'.3	42'.4
04	228° 59'.1	241° 00'.1	42'.7	229° 28'.0	02'.5	161° 46'.4	19'.6	9° 24'.9	42'.4
05	244° 01'.5	255° 59'.7	41'.5	244° 28'.7	01'.7	176° 48'.6	19'.6	24° 27'.4	42'.3
06	259° 04'.0	270° 59'.2	40'.3	259° 29'.4	00'.9	191° 50'.7	19'.7	39° 30'.0	42'.3
07	274° 06'.5	285° 58'.8	39'.1	274° 30'.1	00'.1	206° 52'.9	19'.7	54° 32'.5	42'.3
08	289° 08'.9	300° 58'.4	37'.9	289° 30'.8	0° 59'.3 S	221° 55'.0	19'.8	69° 35'.1	42'.2
09	304° 11'.4	315° 58'.0	36'.6	304° 31'.5	58'.5	236° 57'.2	19'.9	84° 37'.6	42'.2
10	319° 13'.9	330° 57'.5	35'.4	319° 32'.1	57'.7	251° 59'.3	19'.9	99° 40'.2	42'.2
11	334° 16'.3	345° 57'.1	34'.2	334° 32'.8	57'.0	267° 01'.5	20'.0	114° 42'.7	42'.1
12	349° 18'.8	0° 56'.7	6° 33'.0 S	349° 33'.5	0° 56'.2 S	282° 03'.6	21° 20'.0 N	129° 45'.3	12° 42'.1 S
13	4° 21'.3	15° 56'.2	31'.8	4° 34'.2	55'.4	297° 05'.7	20'.1	144° 47'.8	42'.1
14	19° 23'.7	30° 55'.8	30'.6	19° 34'.9	54'.6	312° 07'.9	20'.1	159° 50'.3	42'.0
15	34° 26'.2	45° 55'.4	29'.4	34° 35'.6	53'.8	327° 10'.0	20'.2	174° 52'.9	42'.0
16	49° 28'.6	60° 55'.0	28'.2	49° 36'.3	53'.0	342° 12'.2	20'.2	189° 55'.4	42'.0
17	64° 31'.1	75° 54'.5	27'.0	64° 37'.0	52'.2	357° 14'.3	20'.3	204° 58'.0	41'.9
18	79° 33'.6	90° 54'.1	25'.8	79° 37'.6	51'.4	12° 16'.5	20'.3	220° 00'.5	41'.9
19	94° 36'.0	105° 53'.7	24'.6	94° 38'.3	50'.6	27° 18'.6	20'.4	235° 03'.1	41'.8
20	109° 38'.5	120° 53'.2	23'.4	109° 39'.0	49'.8	42° 20'.7	20'.5	250° 05'.6	41'.8
21	124° 41'.0	135° 52'.8	22'.1	124° 39'.7	49'.0	57° 22'.9	20'.5	265° 08'.2	41'.8
22	139° 43'.4	150° 52'.4	20'.9	139° 40'.4	48'.2	72° 25'.0	20'.6	280° 10'.7	41'.7
23	154° 45'.9	165° 52'.0	19'.7	154° 41'.1	47'.4	87° 27'.2	20'.6	295° 13'.3	41'.7
12 Tuesday 00	169° 48'.4	180° 51'.5	6° 18'.5 S	169° 41'.8	0° 46'.6 S	102° 29'.3	21° 20'.7 N	310° 15'.8	12° 41'.7 S
01	184° 50'.8	195° 51'.1	17'.3	184° 42'.5	45'.8	117° 31'.4	20'.7	325° 18'.4	41'.6
02	199° 53'.3	210° 50'.7	16'.1	199° 43'.2	45'.1	132° 33'.6	20'.8	340° 20'.9	41'.6
03	214° 55'.8	225° 50'.3	14'.9	214° 43'.8	44'.3	147° 35'.7	20'.8	355° 23'.5	41'.6
04	229° 58'.2	240° 49'.8	13'.7	229° 44'.5	43'.5	162° 37'.9	20'.9	10° 26'.0	41'.5
05	245° 00'.7	255° 49'.4	12'.5	244° 45'.2	42'.7	177° 40'.0	20'.9	25° 28'.6	41'.5
06	260° 03'.1	270° 49'.0	11'.2	259° 45'.9	41'.9	192° 42'.1	21'.0	40° 31'.1	41'.5
07	275° 05'.6	285° 48'.6	10'.0	274° 46'.6	41'.1	207° 44'.3	21'.1	55° 33'.7	41'.4
08	290° 08'.1	300° 48'.1	08'.8	289° 47'.3	40'.3	222° 46'.4	21'.1	70° 36'.2	41'.4
09	305° 10'.5	315° 47'.7	07'.6	304° 48'.0	39'.5	237° 48'.5	21'.2	85° 38'.8	41'.4
10	320° 13'.0	330° 47'.3	06'.4	319° 48'.7	38'.7	252° 50'.7	21'.2	100° 41'.3	41'.3
11	335° 15'.5	345° 46'.9	05'.2	334° 49'.3	37'.9	267° 52'.8	21'.3	115° 43'.9	41'.3
12	350° 17'.9	0° 46'.5	6° 04'.0 S	349° 50'.0	0° 37'.1 S	282° 55'.0	21° 21'.3 N	130° 46'.4	12° 41'.2 S
13	5° 20'.4	15° 46'.0	02'.8	4° 50'.7	36'.3	297° 57'.1	21'.4	145° 48'.9	41'.2
14	20° 22'.9	30° 45'.6	01'.5	19° 51'.4	35'.5	312° 59'.2	21'.4	160° 51'.5	41'.2
15	35° 25'.3	45° 45'.2	00'.3	34° 52'.1	34'.7	328° 01'.4	21'.5	175° 54'.0	41'.1
16	50° 27'.8	60° 44'.8	5° 59'.1 S	49° 52'.8	33'.9	343° 03'.5	21'.5	190° 56'.6	41'.1
17	65° 30'.2	75° 44'.3	57'.9	64° 53'.5	33'.1	358° 05'.6	21'.6	205° 59'.1	41'.1
18	80° 32'.7	90° 43'.9	56'.7	79° 54'.2	32'.4	13° 07'.8	21'.7	221° 01'.7	41'.0
19	95° 35'.2	105° 43'.5	55'.5	94° 54'.9	31'.6	28° 09'.9	21'.7	236° 04'.3	41'.0
20	110° 37'.6	120° 43'.1	54'.2	109° 55'.5	30'.8	43° 12'.0	21'.8	251° 06'.8	41'.0
21	125° 40'.1	135° 42'.7	53'.0	124° 56'.2	30'.0	58° 14'.2	21'.8	266° 09'.4	40'.9
22	140° 42'.6	150° 42'.2	51'.8	139° 56'.9	29'.2	73° 16'.3	21'.9	281° 11'.9	40'.9
23	155° 45'.0	165° 41'.8	50'.6	154° 57'.6	28'.4	88° 18'.4	21'.9	296° 14'.5	40'.9
13 Wednesday 00	170° 47'.5	180° 41'.4	5° 49'.4 S	169° 58'.3	0° 27'.6 S	103° 20'.6	21° 22'.0 N	311° 17'.0	12° 40'.8 S
01	185° 50'.0	195° 41'.0	48'.2	184° 59'.0	26'.8	118° 22'.7	22'.0	326° 19'.6	40'.8
02	200° 52'.4	210° 40'.6	46'.9	199° 59'.7	26'.0	133° 24'.8	22'.1	341° 22'.1	40'.7
03	215° 54'.9	225° 40'.1	45'.7	215° 00'.4	25'.2	148° 27'.0	22'.2	356° 24'.7	40'.7
04	230° 57'.4	240° 39'.7	44'.5	230° 01'.1	24'.4	163° 29'.1	22'.2	11° 27'.2	40'.7
05	245° 59'.8	255° 39'.3	43'.3	245° 01'.8	23'.6	178° 31'.2	22'.3	26° 29'.8	40'.6
06	261° 02'.3	270° 38'.9	42'.1	260° 02'.4	22'.8	193° 33'.4	22'.3	41° 32'.3	40'.6
07	276° 04'.7	285° 38'.5	40'.8	275° 03'.1	22'.0	208° 35'.5	22'.4	56° 34'.9	40'.6
08	291° 07'.2	300° 38'.1	39'.6	290° 03'.8	21'.3	223° 37'.6	22'.4	71° 37'.4	40'.5
09	306° 09'.7	315° 37'.6	38'.4	305° 04'.5	20'.5	238° 39'.8	22'.5	86° 40'.0	40'.5
10	321° 12'.1	330° 37'.2	37'.2	320° 05'.2	19'.7	253° 41'.9	22'.5	101° 42'.5	40'.5
11	336° 14'.6	345° 36'.8	36'.0	335° 05'.9	18'.9	268° 44'.0	22'.6	116° 45'.1	40'.4
12	351° 17'.1	0° 36'.4	5° 34'.7 S	350° 06'.6	0° 18'.1 S	283° 46'.2	21° 22'.7 N	131° 47'.6	12° 40'.4 S
13	6° 19'.5	15° 36'.0	33'.5	5° 07'.3	17'.3	298° 48'.3	22'.7	146° 50'.2	40'.3
14	21° 22'.0	30° 35'.6	32'.3	20° 08'.0	16'.5	313° 50'.4	22'.8	161° 52'.7	40'.3
15	36° 24'.5	45° 35'.1	31'.1	35° 08'.7	15'.7	328° 52'.6	22'.8	176° 55'.3	40'.3
16	51° 26'.9	60° 34'.7	29'.9	50° 09'.3	14'.9	343° 54'.7	22'.9	191° 57'.9	40'.2
17	66° 29'.4	75° 34'.3	28'.6	65° 10'.0	14'.1	358° 56'.8	22'.9	207° 00'.4	40'.2
18	81° 31'.9	90° 33'.9	27'.4	80° 10'.7	13'.3	13° 58'.9	23'.0	222° 03'.0	40'.2
19	96° 34'.3	105° 33'.5	26'.2	95° 11'.4	12'.5	29° 01'.1	23'.0	237° 05'.5	40'.1
20	111° 36'.8	120° 33'.1	25'.0	110° 12'.1	11'.7	44° 03'.2	23'.1	252° 08'.1	40'.1
21	126° 39'.2	135° 32'.6	23'.7	125° 12'.8	10'.9	59° 05'.3	23'.2	267° 10'.6	40'.0
22	141° 41'.7	150° 32'.2	22'.5	140° 13'.5	10'.2	74° 07'.5	23'.2	282° 13'.2	40'.0
23	156° 44'.2	165° 31'.8	21'.3	155° 14'.2	09'.4	89° 09'.6	23'.3	297° 15'.7	40'.0
	M.P. 12:39	v -0'.4	d 1'.2	v 0'.7	d 0'.8	v 2'.1	d 0'.1	v 2'.5	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.7	40° 15'.4 S
Achernar	335° 27'.4	57° 10'.4 S
Acrux	173° 08'.8	63° 10'.4 S
Adhara	255° 12'.5	28° 59'.8 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.1 N
Alkaid	152° 58'.6	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.7 S
Alnilam	275° 46'.5	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.6	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.2 S
Antares	112° 26'.4	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.6 N
Atria	107° 28'.3	69° 02'.7 S
Avior	234° 17'.6	59° 33'.5 S
Bellatrix	278° 32'.2	6° 21'.5 N
Betelgeuse	271° 01'.4	7° 24'.3 N
Canopus	263° 56'.1	52° 42'.6 S
Capella	280° 34'.7	46° 00'.7 N
Deneb	49° 31'.9	45° 19'.6 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 55'.0 S
Dubhe	193° 51'.3	61° 40'.6 N
Elnath	278° 12'.8	28° 37'.0 N
Eltanin	90° 46'.3	51° 29'.0 N
Enif	33° 47'.6	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.5	57° 11'.3 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.1 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 44'.1	34° 22'.5 S
Kochab	137° 19'.3	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.5	36° 26'.1 S
Miaplacidus	221° 38'.9	69° 46'.6 S
Mirfak	308° 40'.8	49° 54'.5 N
Nunki	75° 58'.7	26° 16'.6 S
Peacock	53° 19'.9	56° 41'.3 S
Polaris	318° 08'.3	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.6	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.2	8° 11'.5 S
Rigil Kent	139° 51'.5	60° 53'.2 S
Sabik	102° 12'.7	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.7 N
Shaula	96° 22'.2	37° 06'.6 S
Sirius	258° 33'.7	16° 44'.4 S
Spica	158° 31'.1	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.5 S
Vega	80° 39'.2	38° 47'.6 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	11° 03'.2	11:57
Mars	359° 53'.4	12:41
Jupiter	292° 40'.9	17:08
Saturn	140° 27'.5	03:18

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
11 00	177° 28'.9	3° 44'.0 S	188° 55'.0	11'.4	3° 23'.1 S	11'.8	58'.0
01	192° 29'.1	43'.1	203° 25'.4	11'.4	11'.3	11'.8	
02	207° 29'.2	42'.1	217° 55'.8	11'.4	2° 59'.5 S	11'.7	57'.9
03	222° 29'.4	41'.1	232° 26'.2	11'.5	47'.8	11'.8	
04	237° 29'.5	40'.1	246° 56'.7	11'.5	36'.0	11'.8	
05	252° 29'.7	39'.1	261° 27'.2	11'.5	24'.2	11'.8	
06	267° 29'.9	38'.1	275° 57'.7	11'.6	12'.4	11'.8	
07	282° 30'.0	37'.2	290° 28'.3	11'.6	00'.6	11'.8	57'.8
08	297° 30'.2	36'.2	304° 58'.9	11'.6	1° 48'.8 S	11'.8	
09	312° 30'.4	35'.2	319° 29'.5	11'.7	37'.0	11'.8	
10	327° 30'.5	34'.2	334° 00'.2	11'.7	25'.2	11'.8	
11	342° 30'.7	33'.2	348° 30'.9	11'.7	13'.4	11'.7	57'.7
12	357° 30'.9	3° 32'.3 S	3° 01'.6	11'.7	1° 01'.7 S	11'.8	57'.7
13	12° 31'.0	31'.3	17° 32'.3	11'.8	0° 49'.9 S	11'.8	
14	27° 31'.2	30'.3	32° 03'.1	11'.8	38'.1	11'.8	
15	42° 31'.3	29'.3	46° 33'.9	11'.9	26'.3	11'.7	57'.6
16	57° 31'.5	28'.3	61° 04'.8	11'.8	14'.6	11'.8	
17	72° 31'.7	27'.3	75° 35'.6	11'.9	02'.8	11'.7	
18	87° 31'.8	26'.4	90° 06'.5	11'.9	0° 08'.9 N	11'.7	
19	102° 32'.0	25'.4	104° 37'.4	12'.0	20'.6	11'.8	57'.5
20	117° 32'.2	24'.4	119° 08'.4	11'.9	32'.4	11'.7	
21	132° 32'.3	23'.4	133° 39'.3	12'.0	44'.1	11'.7	
22	147° 32'.5	22'.4	148° 10'.3	12'.1	55'.8	11'.6	
23	162° 32'.7	21'.4	162° 41'.4	12'.0	1° 07'.4 N	11'.7	57'.4
12 00	177° 32'.8	3° 20'.5 S	177° 12'.4	12'.0	1° 19'.1 N	11'.6	57'.4
01	192° 33'.0	19'.5	191° 43'.4	12'.1	30'.7	11'.7	
02	207° 33'.2	18'.5	206° 14'.5	12'.1	42'.4	11'.6	
03	222° 33'.3	17'.5	220° 45'.6	12'.2	54'.0	11'.5	57'.3
04	237° 33'.5	16'.5	235° 16'.8	12'.1	2° 05'.5 N	11'.6	
05	252° 33'.7	15'.5	249° 47'.9	12'.2	17'.1	11'.5	
06	267° 33'.8	14'.5	264° 19'.1	12'.1	28'.6	11'.6	
07	282° 34'.0	13'.6	278° 50'.2	12'.2	40'.2	11'.5	57'.2
08	297° 34'.2	12'.6	293° 21'.4	12'.3	51'.7	11'.4	
09	312° 34'.3	11'.6	307° 52'.7	12'.2	3° 03'.1 N	11'.5	
10	327° 34'.5	10'.6	322° 23'.9	12'.2	14'.6	11'.4	
11	342° 34'.7	09'.6	336° 55'.1	12'.3	26'.0	11'.4	57'.1
12	357° 34'.8	3° 08'.6 S	351° 26'.4	12'.3	3° 37'.4 N	11'.3	57'.1
13	12° 35'.0	07'.7	5° 57'.7	12'.3	48'.7	11'.4	
14	27° 35'.2	06'.7	20° 29'.0	12'.3	4° 00'.1 N	11'.3	
15	42° 35'.3	05'.7	35° 00'.3	12'.3	11'.4	11'.2	57'.0
16	57° 35'.5	04'.7	49° 31'.6	12'.4	22'.6	11'.3	
17	72° 35'.7	03'.7	64° 03'.0	12'.3	33'.9	11'.2	
18	87° 35'.8	02'.7	78° 34'.3	12'.4	45'.1	11'.1	
19	102° 36'.0	01'.8	93° 05'.7	12'.4	56'.2	11'.2	56'.9
20	117° 36'.2	00'.8	107° 37'.1	12'.4	5° 07'.4 N	11'.1	
21	132° 36'.3	2° 59'.8 S	122° 08'.5	12'.4	18'.5	11'.0	
22	147° 36'.5	58'.8	136° 39'.9	12'.4	29'.5	11'.0	
23	162° 36'.7	57'.8	151° 11'.3	12'.4	40'.5	11'.0	56'.8
13 00	177° 36'.9	2° 56'.8 S	165° 42'.7	12'.4	5° 51'.5 N	11'.0	56'.8
01	192° 37'.0	55'.8	180° 14'.1	12'.5	6° 02'.5 N	10'.9	
02	207° 37'.2	54'.9	194° 45'.6	12'.4	13'.4	10'.8	56'.7
03	222° 37'.4	53'.9	209° 17'.0	12'.5	24'.2	10'.9	
04	237° 37'.5	52'.9	223° 48'.5	12'.5	35'.1	10'.7	
05	252° 37'.7	51'.9	238° 20'.0	12'.4	45'.8	10'.8	
06	267° 37'.9	50'.9	252° 51'.4	12'.5	56'.6	10'.7	56'.6
07	282° 38'.0	49'.9	267° 22'.9	12'.5	7° 07'.3 N	10'.6	
08	297° 38'.2	48'.9	281° 54'.4	12'.5	17'.9	10'.6	
09	312° 38'.4	48'.0	296° 25'.9	12'.5	28'.5	10'.6	
10	327° 38'.6	47'.0	310° 57'.4	12'.5	39'.1	10'.5	56'.5
11	342° 38'.7	46'.0	325° 28'.9	12'.5	49'.6	10'.4	
12	357° 38'.9	2° 45'.0 S	340° 00'.4	12'.5	8° 00'.0 N	10'.4	56'.5
13	12° 39'.1	44'.0	354° 31'.9	12'.5	10'.4	10'.4	
14	27° 39'.2	43'.0	9° 03'.4	12'.6	20'.8	10'.3	56'.4
15	42° 39'.4	42'.0	23° 35'.0	12'.5	31'.1	10'.2	
16	57° 39'.6	41'.1	38° 06'.5	12'.5	41'.3	10'.2	
17	72° 39'.7	40'.1	52° 38'.0	12'.5	51'.5	10'.2	
18	87° 39'.9	39'.1	67° 09'.5	12'.6	9° 01'.7 N	10'.1	56'.3
19	102° 40'.1	38'.1	81° 41'.1	12'.5	11'.8	10'.0	
20	117° 40'.3	37'.1	96° 12'.6	12'.5	21'.8	10'.0	
21	132° 40'.4	36'.1	110° 44'.1	12'.6	31'.8	9'.9	56'.2
22	147° 40'.6	35'.1	125° 15'.7	12'.5	41'.7	9'.9	
23	162° 40'.8	34'.2	139° 47'.2	12'.5	51'.6	9'.8	
	SD 16'.1	d 1'.0	SD	15'.7	15'.6	15'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 11	Moonrise 12	Moonrise 13
N 72°	04:10	05:32	06:39	06:05	05:54	05:42
N 70°	04:22	05:35	06:36	06:02	05:57	05:52
68°	04:32	05:38	06:33	05:59	06:00	06:00
66°	04:39	05:40	06:31	05:57	06:02	06:06
64°	04:46	05:42	06:29	05:55	06:04	06:12
62°	04:51	05:43	06:27	05:54	06:05	06:17
60°	04:56	05:44	06:26	05:52	06:07	06:21
N 58°	04:59	05:45	06:24	05:51	06:08	06:25
56°	05:03	05:46	06:23	05:50	06:09	06:28
54°	05:06	05:47	06:22	05:49	06:10	06:31
52°	05:08	05:47	06:21	05:48	06:11	06:34
50°	05:10	05:48	06:20	05:47	06:12	06:37
45°	05:15	05:49	06:18	05:45	06:14	06:42
N 40°	05:18	05:49	06:16	05:44	06:15	06:47
35°	05:20	05:50	06:15	05:43	06:17	06:51
30°	05:22	05:50	06:13	05:41	06:18	06:54
20°	05:23	05:49	06:11	05:39	06:20	07:01
N 10°	05:23	05:48	06:09	05:38	06:22	07:06
0°	05:22	05:46	06:06	05:36	06:24	07:11
S 10°	05:19	05:43	06:04	05:34	06:26	07:17
20°	05:14	05:39	06:01	05:32	06:28	07:22
30°	05:06	05:34	05:58	05:30	06:30	07:29
35°	05:01	05:31	05:57	05:29	06:32	07:32
40°	04:55	05:27	05:54	05:28	06:33	07:37
45°	04:47	05:22	05:52	05:27	06:35	07:42
S 50°	04:37	05:16	05:49	05:25	06:37	07:48
52°	04:33	05:14	05:48	05:24	06:38	07:50
54°	04:27	05:10	05:46	05:23	06:39	07:54
56°	04:21	05:07	05:44	05:22	06:40	07:57
58°	04:14	05:03	05:43	05:21	06:42	08:01
S 60°	04:06	04:58	05:40	05:20	06:43	08:05
S 62°	03:56	04:53	05:38	05:18	06:45	08:10

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 11	Moonset 12	Moonset 13
N 72°	17:43	18:50	20:13	18:00	19:51	21:43
N 70°	17:46	18:47	20:00	18:00	19:44	21:27
68°	17:48	18:44	19:50	18:00	19:38	21:15
66°	17:50	18:41	19:42	18:00	19:33	21:05
64°	17:52	18:40	19:36	18:00	19:29	20:56
62°	17:54	18:38	19:30	18:00	19:25	20:49
60°	17:55	18:37	19:25	18:00	19:22	20:43
N 58°	17:56	18:35	19:21	17:59	19:19	20:37
56°	17:57	18:35	19:18	17:59	19:17	20:32
54°	17:59	18:34	19:15	17:59	19:15	20:28
52°	17:59	18:33	19:12	17:59	19:13	20:24
50°	18:00	18:32	19:10	17:59	19:11	20:21
45°	18:02	18:31	19:06	17:59	19:07	20:13
N 40°	18:04	18:31	19:02	17:59	19:04	20:07
35°	18:05	18:30	19:00	17:59	19:01	20:01
30°	18:06	18:30	18:58	17:59	18:58	19:56
20°	18:09	18:31	18:56	17:59	18:54	19:48
N 10°	18:11	18:32	18:56	17:59	18:50	19:41
0°	18:13	18:34	18:58	17:59	18:47	19:34
S 10°	18:15	18:36	19:01	17:59	18:43	19:27
20°	18:18	18:40	19:05	17:59	18:39	19:20
30°	18:20	18:44	19:12	17:59	18:35	19:12
35°	18:22	18:48	19:17	17:58	18:33	19:07
40°	18:24	18:51	19:23	17:58	18:30	19:01
45°	18:27	18:56	19:31	17:58	18:26	18:55
S 50°	18:29	19:02	19:41	17:58	18:23	18:48
52°	18:31	19:05	19:45	17:58	18:21	18:44
54°	18:32	19:08	19:51	17:58	18:19	18:41
56°	18:34	19:11	19:57	17:58	18:17	18:37
58°	18:35	19:15	20:04	17:58	18:14	18:32
S 60°	18:37	19:20	20:12	17:57	18:12	18:27
S 62°	18:40	19:25	20:21	17:57	18:09	18:21

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
11	10 05	9 57	12:10	11:47	24:12	29d 0%
12	9 49	9 41	12:10	12:35	00:12	1d 1%
13	9 33	9 25	12:09	13:23	00:59	2d 3%

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2013 March 14, 15, 16 (Thur, Fri, Saw)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.2		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
14 Thursday 00	171° 46'.6	180° 31'.4	5° 20'.1 S	170° 14'.9	0° 08'.6 S	104° 11'.7	21° 23'.3 N	312° 18'.3	12° 39'.9 S
01	186° 49'.1	195° 31'.0	18'.8	185° 15'.6	07'.8	119° 13'.8	23'.4	327° 20'.8	39'.9
02	201° 51'.6	210° 30'.6	17'.6	200° 16'.3	07'.0	134° 16'.0	23'.4	342° 23'.4	39'.9
03	216° 54'.0	225° 30'.2	16'.4	215° 16'.9	06'.2	149° 18'.1	23'.5	357° 26'.0	39'.8
04	231° 56'.5	240° 29'.7	15'.2	230° 17'.6	05'.4	164° 20'.2	23'.6	12° 28'.5	39'.8
05	246° 59'.0	255° 29'.3	13'.9	245° 18'.3	04'.6	179° 22'.3	23'.6	27° 31'.1	39'.7
06	262° 01'.4	270° 28'.9	12'.7	260° 19'.0	03'.8	194° 24'.5	23'.7	42° 33'.6	39'.7
07	277° 03'.9	285° 28'.5	11'.5	275° 19'.7	03'.0	209° 26'.6	23'.7	57° 36'.2	39'.7
08	292° 06'.3	300° 28'.1	10'.3	290° 20'.4	02'.2	224° 28'.7	23'.8	72° 38'.7	39'.6
09	307° 08'.8	315° 27'.7	09'.0	305° 21'.1	01'.4	239° 30'.8	23'.8	87° 41'.3	39'.6
10	322° 11'.3	330° 27'.3	07'.8	320° 21'.8	00'.6	254° 33'.0	23'.9	102° 43'.8	39'.6
11	337° 13'.7	345° 26'.9	06'.6	335° 22'.5	00'.1	269° 35'.1	23'.9	117° 46'.4	39'.5
12	352° 16'.2	0° 26'.5	5° 05'.4 S	350° 23'.2	0° 00'.9 N	284° 37'.2	21° 24'.0 N	132° 49'.0	12° 39'.5 S
13	7° 18'.7	15° 26'.0	04'.1	5° 23'.9	01'.7	299° 39'.3	24'.1	147° 51'.5	39'.4
14	22° 21'.1	30° 25'.6	02'.9	20° 24'.5	02'.5	314° 41'.5	24'.1	162° 54'.1	39'.4
15	37° 23'.6	45° 25'.2	01'.7	35° 25'.2	03'.3	329° 43'.6	24'.2	177° 56'.6	39'.4
16	52° 26'.1	60° 24'.8	00'.5	50° 25'.9	04'.1	344° 45'.7	24'.2	192° 59'.2	39'.3
17	67° 28'.5	75° 24'.4	4° 59'.2 S	65° 26'.6	04'.9	359° 47'.8	24'.3	208° 01'.7	39'.3
18	82° 31'.0	90° 24'.0	58'.0	80° 27'.3	05'.7	14° 50'.0	24'.3	223° 04'.3	39'.3
19	97° 33'.5	105° 23'.6	56'.8	95° 28'.0	06'.5	29° 52'.1	24'.4	238° 06'.9	39'.2
20	112° 35'.9	120° 23'.2	55'.5	110° 28'.7	07'.3	44° 54'.2	24'.5	253° 09'.4	39'.2
21	127° 38'.4	135° 22'.8	54'.3	125° 29'.4	08'.1	59° 56'.3	24'.5	268° 12'.0	39'.1
22	142° 40'.8	150° 22'.4	53'.1	140° 30'.1	08'.9	74° 58'.4	24'.6	283° 14'.5	39'.1
23	157° 43'.3	165° 21'.9	51'.9	155° 30'.8	09'.6	90° 00'.6	24'.6	298° 17'.1	39'.1
15 Friday 00	172° 45'.8	180° 21'.5	4° 50'.6 S	170° 31'.5	0° 10'.4 N	105° 02'.7	21° 24'.7 N	313° 19'.7	12° 39'.0 S
01	187° 48'.2	195° 21'.1	49'.4	185° 32'.2	11'.2	120° 04'.8	24'.7	328° 22'.2	39'.0
02	202° 50'.7	210° 20'.7	48'.2	200° 32'.9	12'.0	135° 06'.9	24'.8	343° 24'.8	39'.0
03	217° 53'.2	225° 20'.3	46'.9	215° 33'.5	12'.8	150° 09'.0	24'.8	358° 27'.3	38'.9
04	232° 55'.6	240° 19'.9	45'.7	230° 34'.2	13'.6	165° 11'.2	24'.9	13° 29'.9	38'.9
05	247° 58'.1	255° 19'.5	44'.5	245° 34'.9	14'.4	180° 13'.3	25'.0	28° 32'.5	38'.8
06	263° 00'.6	270° 19'.1	43'.2	260° 35'.6	15'.2	195° 15'.4	25'.0	43° 35'.0	38'.8
07	278° 03'.0	285° 18'.7	42'.0	275° 36'.3	16'.0	210° 17'.5	25'.1	58° 37'.6	38'.8
08	293° 05'.5	300° 18'.3	40'.8	290° 37'.0	16'.8	225° 19'.6	25'.1	73° 40'.1	38'.7
09	308° 07'.9	315° 17'.9	39'.6	305° 37'.7	17'.6	240° 21'.8	25'.2	88° 42'.7	38'.7
10	323° 10'.4	330° 17'.5	38'.3	320° 38'.4	18'.4	255° 23'.9	25'.2	103° 45'.3	38'.6
11	338° 12'.9	345° 17'.1	37'.1	335° 39'.1	19'.1	270° 26'.0	25'.3	118° 47'.8	38'.6
12	353° 15'.3	0° 16'.7	4° 35'.9 S	350° 39'.8	0° 19'.9 N	285° 28'.1	21° 25'.4 N	133° 50'.4	12° 38'.6 S
13	8° 17'.8	15° 16'.2	34'.6	5° 40'.5	20'.7	300° 30'.2	25'.4	148° 52'.9	38'.5
14	23° 20'.3	30° 15'.8	33'.4	20° 41'.2	21'.5	315° 32'.3	25'.5	163° 55'.5	38'.5
15	38° 22'.7	45° 15'.4	32'.2	35° 41'.9	22'.3	330° 34'.5	25'.5	178° 58'.1	38'.4
16	53° 25'.2	60° 15'.0	30'.9	50° 42'.5	23'.1	345° 36'.6	25'.6	194° 00'.6	38'.4
17	68° 27'.7	75° 14'.6	29'.7	65° 43'.2	23'.9	0° 38'.7	25'.6	209° 03'.2	38'.4
18	83° 30'.1	90° 14'.2	28'.5	80° 43'.9	24'.7	15° 40'.8	25'.7	224° 05'.7	38'.3
19	98° 32'.6	105° 13'.8	27'.2	95° 44'.6	25'.5	30° 42'.9	25'.8	239° 08'.3	38'.3
20	113° 35'.1	120° 13'.4	26'.0	110° 45'.3	26'.3	45° 45'.0	25'.8	254° 10'.9	38'.3
21	128° 37'.5	135° 13'.0	24'.8	125° 46'.0	27'.1	60° 47'.2	25'.9	269° 13'.4	38'.2
22	143° 40'.0	150° 12'.6	23'.5	140° 46'.7	27'.8	75° 49'.3	25'.9	284° 16'.0	38'.2
23	158° 42'.4	165° 12'.2	22'.3	155° 47'.4	28'.6	90° 51'.4	26'.0	299° 18'.5	38'.1
16 Saturday 00	173° 44'.9	180° 11'.8	4° 21'.1 S	170° 48'.1	0° 29'.4 N	105° 53'.5	21° 26'.0 N	314° 21'.1	12° 38'.1 S
01	188° 47'.4	195° 11'.4	19'.8	185° 48'.8	30'.2	120° 55'.6	26'.1	329° 23'.7	38'.1
02	203° 49'.8	210° 11'.0	18'.6	200° 49'.5	31'.0	135° 57'.7	26'.2	344° 26'.2	38'.0
03	218° 52'.3	225° 10'.6	17'.3	215° 50'.2	31'.8	150° 59'.8	26'.2	359° 28'.8	38'.0
04	233° 54'.8	240° 10'.2	16'.1	230° 50'.9	32'.6	166° 02'.0	26'.3	14° 31'.4	37'.9
05	248° 57'.2	255° 09'.8	14'.9	245° 51'.6	33'.4	181° 04'.1	26'.3	29° 33'.9	37'.9
06	263° 59'.7	270° 09'.4	13'.6	260° 52'.3	34'.2	196° 06'.2	26'.4	44° 36'.5	37'.9
07	279° 02'.2	285° 09'.0	12'.4	275° 52'.9	35'.0	211° 08'.3	26'.4	59° 39'.1	37'.8
08	294° 04'.6	300° 08'.6	11'.2	290° 53'.6	35'.8	226° 10'.4	26'.5	74° 41'.6	37'.8
09	309° 07'.1	315° 08'.2	09'.9	305° 54'.3	36'.5	241° 12'.5	26'.6	89° 44'.2	37'.7
10	324° 09'.6	330° 07'.8	08'.7	320° 55'.0	37'.3	256° 14'.6	26'.6	104° 46'.7	37'.7
11	339° 12'.0	345° 07'.4	07'.5	335° 55'.7	38'.1	271° 16'.7	26'.7	119° 49'.3	37'.7
12	354° 14'.5	0° 07'.0	4° 06'.2 S	350° 56'.4	0° 38'.9 N	286° 18'.9	21° 26'.7 N	134° 51'.9	12° 37'.6 S
13	9° 16'.9	15° 06'.6	05'.0	5° 57'.1	39'.7	301° 21'.0	26'.8	149° 54'.4	37'.6
14	24° 19'.4	30° 06'.2	03'.7	20° 57'.8	40'.5	316° 23'.1	26'.8	164° 57'.0	37'.5
15	39° 21'.9	45° 05'.8	02'.5	35° 58'.5	41'.3	331° 25'.2	26'.9	179° 59'.6	37'.5
16	54° 24'.3	60° 05'.4	01'.3	50° 59'.2	42'.1	346° 27'.3	27'.0	195° 02'.1	37'.5
17	69° 26'.8	75° 05'.0	00'.0	65° 59'.9	42'.9	1° 29'.4	27'.0	210° 04'.7	37'.4
18	84° 29'.3	90° 04'.6	3° 58'.8 S	81° 00'.6	43'.7	16° 31'.5	27'.1	225° 07'.3	37'.4
19	99° 31'.7	105° 04'.2	57'.6	96° 01'.3	44'.5	31° 33'.6	27'.1	240° 09'.8	37'.3
20	114° 34'.2	120° 03'.8	56'.3	111° 02'.0	45'.2	46° 35'.7	27'.2	255° 12'.4	37'.3
21	129° 36'.7	135° 03'.4	55'.1	126° 02'.7	46'.0	61° 37'.8	27'.2	270° 15'.0	37'.3
22	144° 39'.1	150° 03'.0	53'.8	141° 03'.4	46'.8	76° 40'.0	27'.3	285° 17'.5	37'.2
23	159° 41'.6	165° 02'.6	52'.6	156° 04'.0	47'.6	91° 42'.1	27'.4	300° 20'.1	37'.2
	M.P. 12:27	v -0'.4	d 1'.2	v 0'.7	d 0'.8	v 2'.1	d 0'.1	v 2'.6	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.7	40° 15'.4 S
Achernar	335° 27'.4	57° 10'.4 S
Acrux	173° 08'.8	63° 10'.4 S
Adhara	255° 12'.5	28° 59'.8 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.1 N
Alkaid	152° 58'.6	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.7 S
Alnilam	275° 46'.5	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.6	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.1 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.6 N
Atria	107° 28'.2	69° 02'.7 S
Avior	234° 17'.7	59° 33'.5 S
Bellatrix	278° 32'.2	6° 21'.5 N
Betelgeuse	271° 01'.4	7° 24'.3 N
Canopus	263° 56'.1	52° 42'.6 S
Capella	280° 34'.7	46° 00'.7 N
Deneb	49° 31'.9	45° 19'.6 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 54'.9 S
Dubhe	193° 51'.3	61° 40'.6 N
Elnath	278° 12'.8	28° 37'.0 N
Eltanin	90° 46'.3	51° 29'.0 N
Enif	33° 47'.6	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.5	57° 11'.3 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.1 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 44'.1	34° 22'.5 S
Kochab	137° 19'.3	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.4	36° 26'.1 S
Miaplacidus	221° 38'.9	69° 46'.6 S
Mirfak	308° 40'.8	49° 54'.5 N
Nunki	75° 58'.6	26° 16'.6 S
Peacock	53° 19'.9	56° 41'.3 S
Polaris	318° 09'.3	89° 19'.5 N
Pollux	243° 27'.7	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.6	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.2	8° 11'.5 S
Rigil Kent	139° 51'.4	60° 53'.2 S
Sabik	102° 12'.7	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.6 N
Shaula	96° 22'.1	37° 06'.6 S
Sirius	258° 33'.8	16° 44'.4 S
Spica	158° 31'.1	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.5 S
Vega	80° 39'.2	38° 47'.6 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	7° 35'.8	11:59
Mars	357° 45'.7	12:37
Jupiter	292° 16'.9	16:57
Saturn	140° 33'.9	03:06

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
14 00	177° 40'.9	2° 33'.2 S	154° 18'.7	12'.6	10° 01'.4 N	9'.8	56'.2
01	192° 41'.1	32'.2	168° 50'.3	12'.5	11'.2	9'.7	56'.1
02	207° 41'.3	31'.2	183° 21'.8	12'.5	20'.9	9'.6	
03	222° 41'.5	30'.2	197° 53'.3	12'.5	30'.5	9'.6	
04	237° 41'.6	29'.2	212° 24'.8	12'.6	40'.1	9'.5	
05	252° 41'.8	28'.2	226° 56'.4	12'.5	49'.6	9'.5	56'.0
06	267° 42'.0	27'.2	241° 27'.9	12'.5	59'.1	9'.4	
07	282° 42'.1	26'.3	255° 59'.4	12'.5	11° 08'.5 N	9'.3	
08	297° 42'.3	25'.3	270° 30'.9	12'.6	17'.8	9'.3	
09	312° 42'.5	24'.3	285° 02'.5	12'.5	27'.1	9'.2	55'.9
10	327° 42'.7	23'.3	299° 34'.0	12'.5	36'.3	9'.2	
11	342° 42'.8	22'.3	314° 05'.5	12'.5	45'.5	9'.1	
12	357° 43'.0	2° 21'.3 S	328° 37'.0	12'.5	11° 54'.6 N	9'.0	55'.9
13	12° 43'.2	20'.3	343° 08'.5	12'.5	12° 03'.6 N	8'.9	55'.8
14	27° 43'.4	19'.4	357° 40'.0	12'.5	12'.5	8'.9	
15	42° 43'.5	18'.4	12° 11'.5	12'.5	21'.4	8'.8	
16	57° 43'.7	17'.4	26° 43'.0	12'.4	30'.2	8'.8	
17	72° 43'.9	16'.4	41° 14'.4	12'.5	39'.0	8'.6	55'.7
18	87° 44'.1	15'.4	55° 45'.9	12'.5	47'.6	8'.7	
19	102° 44'.2	14'.4	70° 17'.4	12'.5	56'.3	8'.5	
20	117° 44'.4	13'.4	84° 48'.9	12'.4	13° 04'.8 N	8'.5	
21	132° 44'.6	12'.4	99° 20'.3	12'.5	13'.3	8'.4	55'.6
22	147° 44'.8	11'.5	113° 51'.8	12'.4	21'.7	8'.3	
23	162° 44'.9	10'.5	128° 23'.2	12'.4	30'.0	8'.3	
15 00	177° 45'.1	2° 09'.5 S	142° 54'.6	12'.5	13° 38'.3 N	8'.1	55'.6
01	192° 45'.3	08'.5	157° 26'.1	12'.4	46'.4	8'.2	55'.5
02	207° 45'.4	07'.5	171° 57'.5	12'.4	54'.6	8'.0	
03	222° 45'.6	06'.5	186° 28'.9	12'.4	14° 02'.6 N	8'.0	
04	237° 45'.8	05'.5	201° 00'.3	12'.4	10'.6	7'.8	
05	252° 46'.0	04'.5	215° 31'.7	12'.4	18'.4	7'.9	55'.4
06	267° 46'.1	03'.6	230° 03'.1	12'.4	26'.3	7'.7	
07	282° 46'.3	02'.6	244° 34'.5	12'.4	34'.0	7'.7	
08	297° 46'.5	01'.6	259° 05'.9	12'.4	41'.7	7'.6	
09	312° 46'.7	00'.6	273° 37'.3	12'.3	49'.3	7'.5	
10	327° 46'.8	1° 59'.6 S	288° 08'.6	12'.4	56'.8	7'.4	55'.3
11	342° 47'.0	58'.6	302° 40'.0	12'.3	15° 04'.2 N	7'.4	
12	357° 47'.2	1° 57'.6 S	317° 11'.3	12'.4	15° 11'.6 N	7'.2	55'.3
13	12° 47'.4	56'.6	331° 42'.7	12'.3	18'.8	7'.2	
14	27° 47'.6	55'.7	346° 14'.0	12'.3	26'.0	7'.2	55'.2
15	42° 47'.7	54'.7	0° 45'.3	12'.3	33'.2	7'.0	
16	57° 47'.9	53'.7	15° 16'.6	12'.3	40'.2	7'.0	
17	72° 48'.1	52'.7	29° 47'.9	12'.3	47'.2	6'.9	
18	87° 48'.3	51'.7	44° 19'.2	12'.3	54'.1	6'.8	
19	102° 48'.4	50'.7	58° 50'.5	12'.3	16° 00'.9 N	6'.7	55'.1
20	117° 48'.6	49'.7	73° 21'.8	12'.3	07'.6	6'.6	
21	132° 48'.8	48'.7	87° 53'.1	12'.2	14'.2	6'.6	
22	147° 49'.0	47'.8	102° 24'.3	12'.3	20'.8	6'.5	
23	162° 49'.1	46'.8	116° 55'.6	12'.2	27'.3	6'.4	
16 00	177° 49'.3	1° 45'.8 S	131° 26'.8	12'.2	16° 33'.7 N	6'.3	55'.0
01	192° 49'.5	44'.8	145° 58'.0	12'.2	40'.0	6'.2	
02	207° 49'.7	43'.8	160° 29'.2	12'.3	46'.2	6'.1	
03	222° 49'.8	42'.8	175° 00'.5	12'.2	52'.3	6'.1	
04	237° 50'.0	41'.8	189° 31'.7	12'.2	58'.4	6'.0	
05	252° 50'.2	40'.8	204° 02'.9	12'.1	17° 04'.4 N	5'.9	54'.9
06	267° 50'.4	39'.8	218° 34'.0	12'.2	10'.3	5'.8	
07	282° 50'.6	38'.9	233° 05'.2	12'.2	16'.1	5'.7	
08	297° 50'.7	37'.9	247° 36'.4	12'.1	21'.8	5'.6	
09	312° 50'.9	36'.9	262° 07'.5	12'.2	27'.4	5'.6	
10	327° 51'.1	35'.9	276° 38'.7	12'.1	33'.0	5'.5	54'.8
11	342° 51'.3	34'.9	291° 09'.8	12'.2	38'.5	5'.3	
12	357° 51'.4	1° 33'.9 S	305° 41'.0	12'.1	17° 43'.8 N	5'.3	54'.8
13	12° 51'.6	32'.9	320° 12'.1	12'.1	49'.1	5'.2	
14	27° 51'.8	31'.9	334° 43'.2	12'.1	54'.3	5'.1	
15	42° 52'.0	31'.0	349° 14'.3	12'.1	59'.4	5'.1	
16	57° 52'.2	30'.0	3° 45'.4	12'.1	18° 04'.5 N	4'.9	54'.7
17	72° 52'.3	29'.0	18° 16'.5	12'.1	09'.4	4'.9	
18	87° 52'.5	28'.0	32° 47'.6	12'.0	14'.3	4'.7	
19	102° 52'.7	27'.0	47° 18'.6	12'.1	19'.0	4'.7	
20	117° 52'.9	26'.0	61° 49'.7	12'.1	23'.7	4'.6	
21	132° 53'.1	25'.0	76° 20'.8	12'.0	28'.3	4'.5	
22	147° 53'.2	24'.0	90° 51'.8	12'.1	32'.8	4'.4	
23	162° 53'.4	23'.1	105° 22'.9	12'.0	37'.2	4'.3	54'.6
	SD 16'.1	d 1'.0	SD	15'.2	15'.1	14'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 14	Moonrise 15	Moonrise 16
N 72°	03:53	05:16	06:23	05:30	05:13	04:45
N 70°	04:07	05:21	06:22	05:47	05:42	05:36
68°	04:18	05:25	06:20	06:01	06:03	06:08
66°	04:27	05:28	06:19	06:12	06:20	06:32
64°	04:35	05:31	06:18	06:22	06:34	06:50
62°	04:41	05:33	06:17	06:30	06:46	07:06
60°	04:46	05:35	06:16	06:37	06:56	07:19
N 58°	04:51	05:37	06:16	06:43	07:04	07:30
56°	04:55	05:38	06:15	06:49	07:12	07:40
54°	04:58	05:39	06:15	06:54	07:19	07:48
52°	05:01	05:40	06:14	06:58	07:25	07:56
50°	05:04	05:41	06:14	07:03	07:31	08:03
45°	05:09	05:43	06:12	07:12	07:43	08:18
N 40°	05:13	05:45	06:11	07:19	07:53	08:30
35°	05:16	05:45	06:11	07:26	08:02	08:41
30°	05:18	05:46	06:10	07:31	08:10	08:50
20°	05:21	05:46	06:08	07:41	08:23	09:06
N 10°	05:22	05:46	06:07	07:50	08:34	09:20
0°	05:21	05:45	06:06	07:58	08:45	09:33
S 10°	05:19	05:43	06:04	08:07	08:57	09:46
20°	05:15	05:40	06:02	08:16	09:08	10:00
30°	05:08	05:36	06:00	08:26	09:22	10:17
35°	05:04	05:34	05:59	08:32	09:30	10:26
40°	04:59	05:31	05:58	08:39	09:39	10:37
45°	04:52	05:27	05:56	08:47	09:50	10:50
S 50°	04:43	05:21	05:54	08:56	10:02	11:05
52°	04:39	05:19	05:53	09:01	10:08	11:13
54°	04:34	05:16	05:52	09:06	10:15	11:21
56°	04:28	05:13	05:51	09:11	10:23	11:30
58°	04:22	05:10	05:49	09:17	10:31	11:40
S 60°	04:14	05:06	05:48	09:24	10:41	11:52
S 62°	04:06	05:01	05:46	09:32	10:52	12:07

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 14	Moonset 15	Moonset 16
N 72°	17:57	19:04	20:29	23:38	-	01:45
N 70°	17:58	18:59	20:14	23:11	-	00:55
68°	17:59	18:55	20:03	22:50	-	00:24
66°	18:00	18:51	19:53	22:34	-	00:00
64°	18:01	18:48	19:45	22:21	23:42	24:58
62°	18:02	18:46	19:39	22:10	23:28	24:39
60°	18:03	18:44	19:33	22:01	23:15	24:24
N 58°	18:03	18:42	19:29	21:53	23:04	24:11
56°	18:04	18:41	19:24	21:45	22:55	24:00
54°	18:04	18:39	19:21	21:39	22:47	23:50
52°	18:05	18:38	19:18	21:33	22:40	23:42
50°	18:05	18:37	19:15	21:28	22:33	23:34
45°	18:06	18:35	19:10	21:17	22:19	23:17
N 40°	18:07	18:34	19:05	21:08	22:07	23:04
35°	18:08	18:33	19:02	21:00	21:57	22:52
30°	18:08	18:32	19:00	20:53	21:48	22:42
20°	18:10	18:32	18:57	20:41	21:34	22:25
N 10°	18:11	18:32	18:56	20:31	21:20	22:10
0°	18:12	18:33	18:57	20:21	21:08	21:56
S 10°	18:13	18:34	18:59	20:11	20:56	21:42
20°	18:15	18:37	19:03	20:01	20:43	21:27
30°	18:17	18:41	19:09	19:49	20:28	21:10
35°	18:18	18:43	19:13	19:42	20:20	21:00
40°	18:19	18:46	19:18	19:35	20:10	20:49
45°	18:21	18:50	19:25	19:26	19:59	20:35
S 50°	18:23	18:55	19:34	19:15	19:45	20:19
52°	18:24	18:58	19:38	19:10	19:38	20:11
54°	18:25	19:00	19:43	19:04	19:31	20:03
56°	18:26	19:03	19:48	18:58	19:23	19:54
58°	18:27	19:06	19:54	18:52	19:15	19:43
S 60°	18:28	19:10	20:01	18:44	19:04	19:30
S 62°	18:30	19:15	20:10	18:35	18:53	19:16

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
14	9 17	9 08	12:09	14:10	01:46	3d 8%
15	9 00	8 52	12:09	14:57	02:33	4d 14%
16	8 43	8 35	12:09	15:44	03:21	5d 21%

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2013 March 17, 18, 19 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.2		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
17 Sunday 00	174° 44'.0	180° 02'.2	3° 51'.4 S	171° 04'.7	0° 48'.4 N	106° 44'.2	21° 27'.4 N	315° 22'.7	12° 37'.1 S
01	189° 46'.5	195° 01'.8	50'.1	186° 05'.4	49'.2	121° 46'.3	27'.5	330° 25'.2	37'.1
02	204° 49'.0	210° 01'.4	48'.9	201° 06'.1	50'.0	136° 48'.4	27'.5	345° 27'.8	37'.1
03	219° 51'.4	225° 01'.0	47'.6	216° 06'.8	50'.8	151° 50'.5	27'.6	0° 30'.4	37'.0
04	234° 53'.9	240° 00'.6	46'.4	231° 07'.5	51'.6	166° 52'.6	27'.6	15° 32'.9	37'.0
05	249° 56'.4	255° 00'.2	45'.2	246° 08'.2	52'.3	181° 54'.7	27'.7	30° 35'.5	36'.9
06	264° 58'.8	269° 59'.8	43'.9	261° 08'.9	53'.1	196° 56'.8	27'.8	45° 38'.1	36'.9
07	280° 01'.3	284° 59'.4	42'.7	276° 09'.6	53'.9	211° 58'.9	27'.8	60° 40'.6	36'.9
08	295° 03'.8	299° 59'.0	41'.4	291° 10'.3	54'.7	227° 01'.0	27'.9	75° 43'.2	36'.8
09	310° 06'.2	314° 58'.6	40'.2	306° 11'.0	55'.5	242° 03'.1	27'.9	90° 45'.8	36'.8
10	325° 08'.7	329° 58'.2	39'.0	321° 11'.7	56'.3	257° 05'.2	28'.0	105° 48'.3	36'.7
11	340° 11'.2	344° 57'.8	37'.7	336° 12'.4	57'.1	272° 07'.3	28'.0	120° 50'.9	36'.7
12	355° 13'.6	359° 57'.4	3° 36'.5 S	351° 13'.1	0° 57'.9 N	287° 09'.5	21° 28'.1 N	135° 53'.5	12° 36'.7 S
13	10° 16'.1	14° 57'.0	35'.2	6° 13'.8	58'.7	302° 11'.6	28'.2	150° 56'.0	36'.6
14	25° 18'.5	29° 56'.6	34'.0	21° 14'.5	59'.5	317° 13'.7	28'.2	165° 58'.6	36'.6
15	40° 21'.0	44° 56'.2	32'.7	36° 15'.2	1° 00'.2 N	332° 15'.8	28'.3	181° 01'.2	36'.5
16	55° 23'.5	59° 55'.8	31'.5	51° 15'.9	01'.0	347° 17'.9	28'.3	196° 03'.7	36'.5
17	70° 25'.9	74° 55'.4	30'.3	66° 16'.6	01'.8	2° 20'.0	28'.4	211° 06'.3	36'.5
18	85° 28'.4	89° 55'.0	29'.0	81° 17'.2	02'.6	17° 22'.1	28'.5	226° 08'.9	36'.4
19	100° 30'.9	104° 54'.6	27'.8	96° 17'.9	03'.4	32° 24'.2	28'.5	241° 11'.4	36'.4
20	115° 33'.3	119° 54'.2	26'.5	111° 18'.6	04'.2	47° 26'.3	28'.6	256° 14'.0	36'.3
21	130° 35'.8	134° 53'.8	25'.3	126° 19'.3	05'.0	62° 28'.4	28'.6	271° 16'.6	36'.3
22	145° 38'.3	149° 53'.4	24'.0	141° 20'.0	05'.8	77° 30'.5	28'.7	286° 19'.1	36'.2
23	160° 40'.7	164° 53'.0	22'.8	156° 20'.7	06'.6	92° 32'.6	28'.7	301° 21'.7	36'.2
18 Monday 00	175° 43'.2	179° 52'.7	3° 21'.6 S	171° 21'.4	1° 07'.3 N	107° 34'.7	21° 28'.8 N	316° 24'.3	12° 36'.2 S
01	190° 45'.7	194° 52'.3	20'.3	186° 22'.1	08'.1	122° 36'.8	28'.9	331° 26'.8	36'.1
02	205° 48'.1	209° 51'.9	19'.1	201° 22'.8	08'.9	137° 38'.9	28'.9	346° 29'.4	36'.1
03	220° 50'.6	224° 51'.5	17'.8	216° 23'.5	09'.7	152° 41'.0	29'.0	1° 32'.0	36'.0
04	235° 53'.0	239° 51'.1	16'.6	231° 24'.2	10'.5	167° 43'.1	29'.0	16° 34'.6	36'.0
05	250° 55'.5	254° 50'.7	15'.3	246° 24'.9	11'.3	182° 45'.2	29'.1	31° 37'.1	36'.0
06	265° 58'.0	269° 50'.3	14'.1	261° 25'.6	12'.1	197° 47'.3	29'.1	46° 39'.7	35'.9
07	281° 00'.4	284° 49'.9	12'.8	276° 26'.3	12'.9	212° 49'.4	29'.2	61° 42'.3	35'.9
08	296° 02'.9	299° 49'.5	11'.6	291° 27'.0	13'.7	227° 51'.5	29'.3	76° 44'.8	35'.8
09	311° 05'.4	314° 49'.1	10'.4	306° 27'.7	14'.4	242° 53'.6	29'.3	91° 47'.4	35'.8
10	326° 07'.8	329° 48'.7	09'.1	321° 28'.4	15'.2	257° 55'.7	29'.4	106° 50'.0	35'.7
11	341° 10'.3	344° 48'.3	07'.9	336° 29'.1	16'.0	272° 57'.8	29'.4	121° 52'.6	35'.7
12	356° 12'.8	359° 47'.9	3° 06'.6 S	351° 29'.8	1° 16'.8 N	287° 59'.9	21° 29'.5 N	136° 55'.1	12° 35'.7 S
13	11° 15'.2	14° 47'.5	05'.4	6° 30'.5	17'.6	303° 02'.0	29'.6	151° 57'.7	35'.6
14	26° 17'.7	29° 47'.1	04'.1	21° 31'.2	18'.4	318° 04'.1	29'.6	167° 00'.3	35'.6
15	41° 20'.1	44° 46'.8	02'.9	36° 31'.9	19'.2	333° 06'.2	29'.7	182° 02'.8	35'.5
16	56° 22'.6	59° 46'.4	01'.6	51° 32'.6	20'.0	348° 08'.3	29'.7	197° 05'.4	35'.5
17	71° 25'.1	74° 46'.0	00'.4	66° 33'.2	20'.7	3° 10'.4	29'.8	212° 08'.0	35'.5
18	86° 27'.5	89° 45'.6	2° 59'.1 S	81° 33'.9	21'.5	18° 12'.5	29'.8	227° 10'.6	35'.4
19	101° 30'.0	104° 45'.2	57'.9	96° 34'.6	22'.3	33° 14'.6	29'.9	242° 13'.1	35'.4
20	116° 32'.5	119° 44'.8	56'.6	111° 35'.3	23'.1	48° 16'.7	30'.0	257° 15'.7	35'.3
21	131° 34'.9	134° 44'.4	55'.4	126° 36'.0	23'.9	63° 18'.8	30'.0	272° 18'.3	35'.3
22	146° 37'.4	149° 44'.0	54'.2	141° 36'.7	24'.7	78° 20'.9	30'.1	287° 20'.8	35'.2
23	161° 39'.9	164° 43'.6	52'.9	156° 37'.4	25'.5	93° 23'.0	30'.1	302° 23'.4	35'.2
19 Tuesday 00	176° 42'.3	179° 43'.2	2° 51'.7 S	171° 38'.1	1° 26'.3 N	108° 25'.1	21° 30'.2 N	317° 26'.0	12° 35'.2 S
01	191° 44'.8	194° 42'.8	50'.4	186° 38'.8	27'.0	123° 27'.2	30'.3	332° 28'.6	35'.1
02	206° 47'.3	209° 42'.4	49'.2	201° 39'.5	27'.8	138° 29'.3	30'.3	347° 31'.1	35'.1
03	221° 49'.7	224° 42'.1	47'.9	216° 40'.2	28'.6	153° 31'.4	30'.4	2° 33'.7	35'.0
04	236° 52'.2	239° 41'.7	46'.7	231° 40'.9	29'.4	168° 33'.4	30'.4	17° 36'.3	35'.0
05	251° 54'.6	254° 41'.3	45'.4	246° 41'.6	30'.2	183° 35'.5	30'.5	32° 38'.9	34'.9
06	266° 57'.1	269° 40'.9	44'.2	261° 42'.3	31'.0	198° 37'.6	30'.6	47° 41'.4	34'.9
07	281° 59'.6	284° 40'.5	42'.9	276° 43'.0	31'.8	213° 39'.7	30'.6	62° 44'.0	34'.9
08	297° 02'.0	299° 40'.1	41'.7	291° 43'.7	32'.6	228° 41'.8	30'.7	77° 46'.6	34'.8
09	312° 04'.5	314° 39'.7	40'.4	306° 44'.4	33'.3	243° 43'.9	30'.7	92° 49'.1	34'.8
10	327° 07'.0	329° 39'.3	39'.2	321° 45'.1	34'.1	258° 46'.0	30'.8	107° 51'.7	34'.7
11	342° 09'.4	344° 38'.9	37'.9	336° 45'.8	34'.9	273° 48'.1	30'.8	122° 54'.3	34'.7
12	357° 11'.9	359° 38'.5	2° 36'.7 S	351° 46'.5	1° 35'.7 N	288° 50'.2	21° 30'.9 N	137° 56'.9	12° 34'.7 S
13	12° 14'.4	14° 38'.2	35'.4	6° 47'.2	36'.5	303° 52'.3	31'.0	152° 59'.4	34'.6
14	27° 16'.8	29° 37'.8	34'.2	21° 47'.9	37'.3	318° 54'.4	31'.0	168° 02'.0	34'.6
15	42° 19'.3	44° 37'.4	32'.9	36° 48'.6	38'.1	333° 56'.5	31'.1	183° 04'.6	34'.5
16	57° 21'.8	59° 37'.0	31'.7	51° 49'.3	38'.8	348° 58'.6	31'.1	198° 07'.2	34'.5
17	72° 24'.2	74° 36'.6	30'.4	66° 50'.0	39'.6	4° 00'.7	31'.2	213° 09'.7	34'.4
18	87° 26'.7	89° 36'.2	29'.2	81° 50'.7	40'.4	19° 02'.7	31'.3	228° 12'.3	34'.4
19	102° 29'.1	104° 35'.8	27'.9	96° 51'.4	41'.2	34° 04'.8	31'.3	243° 14'.9	34'.4
20	117° 31'.6	119° 35'.4	26'.7	111° 52'.1	42'.0	49° 06'.9	31'.4	258° 17'.5	34'.3
21	132° 34'.1	134° 35'.1	25'.4	126° 52'.8	42'.8	64° 09'.0	31'.4	273° 20'.0	34'.3
22	147° 36'.5	149° 34'.7	24'.2	141° 53'.5	43'.6	79° 11'.1	31'.5	288° 22'.6	34'.2
23	162° 39'.0	164° 34'.3	22'.9	156° 54'.1	44'.4	94° 13'.2	31'.5	303° 25'.2	34'.2
	M.P. 12:15	v -0'.4	d 1'.2	v 0'.7	d 0'.8	v 2'.1	d 0'.1	v 2'.6	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.7	40° 15'.4 S
Achernar	335° 27'.4	57° 10'.4 S
Acrux	173° 08'.8	63° 10'.4 S
Adhara	255° 12'.5	28° 59'.8 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.1 N
Alkaid	152° 58'.6	49° 14'.6 N
Alnair	27° 44'.4	46° 53'.7 S
Alnilam	275° 46'.5	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.5	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.1 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.6 N
Atria	107° 28'.2	69° 02'.7 S
Avior	234° 17'.7	59° 33'.5 S
Bellatrix	278° 32'.2	6° 21'.5 N
Betelgeuse	271° 01'.5	7° 24'.3 N
Canopus	263° 56'.1	52° 42'.6 S
Capella	280° 34'.7	46° 00'.7 N
Deneb	49° 31'.9	45° 19'.6 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 54'.9 S
Dubhe	193° 51'.3	61° 40'.7 N
Elnath	278° 12'.8	28° 37'.0 N
Eltanin	90° 46'.2	51° 29'.0 N
Enif	33° 47'.5	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.5	57° 11'.3 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.5	60° 26'.1 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 44'.1	34° 22'.5 S
Kochab	137° 19'.2	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.4	36° 26'.1 S
Miaplacidus	221° 39'.0	69° 46'.7 S
Mirfak	308° 40'.8	49° 54'.5 N
Nunki	75° 58'.6	26° 16'.6 S
Peacock	53° 19'.9	56° 41'.2 S
Polaris	318° 10'.2	89° 19'.5 N
Pollux	243° 27'.8	27° 59'.5 N
Procyon	244° 59'.7	5° 11'.2 N
Rasalhague	96° 06'.6	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.3	8° 11'.5 S
Rigil Kent	139° 51'.4	60° 53'.2 S
Sabik	102° 12'.7	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.6 N
Shaula	96° 22'.1	37° 06'.6 S
Sirius	258° 33'.8	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.2	43° 29'.5 S
Vega	80° 39'.1	38° 47'.6 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	4° 09'.5	12:01
Mars	355° 38'.2	12:34
Jupiter	291° 51'.5	16:47
Saturn	140° 41'.1	02:54

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
17 00	177° 53'.6	1° 22'.1 S	119° 53'.9	12'.0	18° 41'.5 N	4'.2	54'.6
01	192° 53'.8	21'.1	134° 24'.9	12'.0	45'.7	4'.2	
02	207° 53'.9	20'.1	148° 55'.9	12'.0	49'.9	4'.0	
03	222° 54'.1	19'.1	163° 26'.9	12'.0	53'.9	4'.0	
04	237° 54'.3	18'.1	177° 57'.9	12'.0	57'.9	3'.8	
05	252° 54'.5	17'.1	192° 28'.9	12'.0	19° 01'.7 N	3'.8	
06	267° 54'.7	16'.1	206° 59'.9	12'.0	05'.5	3'.7	54'.5
07	282° 54'.8	15'.1	221° 30'.9	12'.0	09'.2	3'.6	
08	297° 55'.0	14'.2	236° 01'.9	12'.0	12'.8	3'.5	
09	312° 55'.2	13'.2	250° 32'.9	11'.9	16'.3	3'.4	
10	327° 55'.4	12'.2	265° 03'.8	12'.0	19'.7	3'.3	
11	342° 55'.6	11'.2	279° 34'.8	12'.0	23'.0	3'.2	
12	357° 55'.7	1° 10'.2 S	294° 05'.8	11'.9	19° 26'.2 N	3'.1	54'.5
13	12° 55'.9	09'.2	308° 36'.7	12'.0	29'.3	3'.1	
14	27° 56'.1	08'.2	323° 07'.7	11'.9	32'.4	2'.9	54'.4
15	42° 56'.3	07'.2	337° 38'.6	11'.9	35'.3	2'.9	
16	57° 56'.5	06'.2	352° 09'.5	12'.0	38'.2	2'.7	
17	72° 56'.6	05'.3	6° 40'.5	11'.9	40'.9	2'.7	
18	87° 56'.8	04'.3	21° 11'.4	11'.9	43'.6	2'.6	
19	102° 57'.0	03'.3	35° 42'.3	11'.9	46'.2	2'.4	
20	117° 57'.2	02'.3	50° 13'.2	11'.9	48'.6	2'.4	
21	132° 57'.4	01'.3	64° 44'.1	12'.0	51'.0	2'.3	
22	147° 57'.6	00'.3	79° 15'.1	11'.9	53'.3	2'.2	
23	162° 57'.7	0° 59'.3 S	93° 46'.0	11'.9	55'.5	2'.1	
18 00	177° 57'.9	0° 58'.3 S	108° 16'.9	11'.9	19° 57'.6 N	2'.0	54'.4
01	192° 58'.1	57'.4	122° 47'.8	11'.9	59'.6	2'.0	54'.3
02	207° 58'.3	56'.4	137° 18'.7	11'.9	20° 01'.6 N	1'.8	
03	222° 58'.5	55'.4	151° 49'.6	11'.9	03'.4	1'.7	
04	237° 58'.6	54'.4	166° 20'.5	11'.9	05'.1	1'.6	
05	252° 58'.8	53'.4	180° 51'.4	11'.9	06'.7	1'.6	
06	267° 59'.0	52'.4	195° 22'.3	11'.9	08'.3	1'.4	
07	282° 59'.2	51'.4	209° 53'.2	11'.8	09'.7	1'.4	
08	297° 59'.4	50'.4	224° 24'.0	11'.9	11'.1	1'.2	
09	312° 59'.5	49'.4	238° 54'.9	11'.9	12'.3	1'.2	
10	327° 59'.7	48'.5	253° 25'.8	11'.9	13'.5	1'.1	
11	342° 59'.9	47'.5	267° 56'.7	11'.9	14'.6	1'.0	
12	358° 00'.1	0° 46'.5 S	282° 27'.6	11'.9	20° 15'.6 N	0'.8	54'.3
13	13° 00'.3	45'.5	296° 58'.5	11'.9	16'.4	0'.8	
14	28° 00'.5	44'.5	311° 29'.4	11'.9	17'.2	0'.7	
15	43° 00'.6	43'.5	326° 00'.3	11'.9	17'.9	0'.6	
16	58° 00'.8	42'.5	340° 31'.2	11'.9	18'.5	0'.5	
17	73° 01'.0	41'.5	355° 02'.1	11'.9	19'.0	0'.4	
18	88° 01'.2	40'.5	9° 33'.0	11'.9	19'.4	0'.3	
19	103° 01'.4	39'.6	24° 03'.9	11'.9	19'.7	0'.3	
20	118° 01'.6	38'.6	38° 34'.8	11'.9	20'.0	0'.1	54'.2
21	133° 01'.7	37'.6	53° 05'.7	11'.9	20'.1	0'.0	
22	148° 01'.9	36'.6	67° 36'.6	11'.9	20'.1	0'.1	
23	163° 02'.1	35'.6	82° 07'.5	11'.9	20'.0	0'.1	
19 00	178° 02'.3	0° 34'.6 S	96° 38'.4	11'.9	20° 19'.9 N	0'.3	54'.2
01	193° 02'.5	33'.6	111° 09'.3	11'.9	19'.6	0'.3	
02	208° 02'.7	32'.6	125° 40'.2	11'.9	19'.3	0'.5	
03	223° 02'.8	31'.7	140° 11'.1	12'.0	18'.8	0'.5	
04	238° 03'.0	30'.7	154° 42'.1	11'.9	18'.3	0'.6	
05	253° 03'.2	29'.7	169° 13'.0	11'.9	17'.7	0'.7	
06	268° 03'.4	28'.7	183° 43'.9	12'.0	17'.0	0'.9	
07	283° 03'.6	27'.7	198° 14'.9	11'.9	16'.1	0'.9	
08	298° 03'.8	26'.7	212° 45'.8	12'.0	15'.2	1'.0	
09	313° 03'.9	25'.7	227° 16'.8	11'.9	14'.2	1'.1	
10	328° 04'.1	24'.7	241° 47'.7	12'.0	13'.1	1'.2	
11	343° 04'.3	23'.7	256° 18'.7	11'.9	11'.9	1'.3	
12	358° 04'.5	0° 22'.8 S	270° 49'.6	12'.0	20° 10'.6 N	1'.3	54'.3
13	13° 04'.7	21'.8	285° 20'.6	12'.0	09'.3	1'.5	
14	28° 04'.9	20'.8	299° 51'.6	12'.0	07'.8	1'.6	
15	43° 05'.0	19'.8	314° 22'.6	12'.0	06'.2	1'.6	
16	58° 05'.2	18'.8	328° 53'.6	12'.0	04'.6	1'.8	
17	73° 05'.4	17'.8	343° 24'.6	12'.0	02'.8	1'.8	
18	88° 05'.6	16'.8	357° 55'.6	12'.0	01'.0	2'.0	
19	103° 05'.8	15'.8	12° 26'.6	12'.0	19° 59'.0 N	2'.0	
20	118° 06'.0	14'.9	26° 57'.6	12'.0	57'.0	2'.1	
21	133° 06'.1	13'.9	41° 28'.6	12'.1	54'.9	2'.3	
22	148° 06'.3	12'.9	55° 59'.7	12'.0	52'.6	2'.3	
23	163° 06'.5	11'.9	70° 30'.7	12'.1	50'.3	2'.4	
	SD 16'.1	d 1'.0	SD 14'.8		14'.8		14'.8

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 17	Moonrise 18	Moonrise 19
N 72°	03:34	05:01	06:08	-	-	-
N 70°	03:51	05:07	06:08	05:28	-	-
68°	04:04	05:12	06:08	06:18	06:41	07:26
66°	04:14	05:17	06:08	06:50	07:20	08:07
64°	04:23	05:20	06:08	07:14	07:48	08:35
62°	04:30	05:23	06:08	07:33	08:09	08:56
60°	04:37	05:26	06:07	07:48	08:26	09:14
N 58°	04:42	05:28	06:07	08:01	08:40	09:28
56°	04:46	05:30	06:07	08:13	08:53	09:41
54°	04:50	05:32	06:07	08:23	09:03	09:51
52°	04:54	05:34	06:07	08:31	09:13	10:01
50°	04:57	05:35	06:07	08:39	09:22	10:10
45°	05:03	05:38	06:07	08:56	09:40	10:28
N 40°	05:08	05:40	06:07	09:10	09:55	10:43
35°	05:12	05:41	06:06	09:22	10:07	10:55
30°	05:15	05:42	06:06	09:33	10:18	11:06
20°	05:18	05:44	06:06	09:51	10:37	11:25
N 10°	05:20	05:44	06:05	10:06	10:53	11:42
0°	05:20	05:44	06:05	10:21	11:09	11:57
S 10°	05:19	05:43	06:04	10:36	11:24	12:12
20°	05:16	05:41	06:03	10:51	11:41	12:29
30°	05:10	05:38	06:02	11:09	12:00	12:48
35°	05:07	05:36	06:02	11:20	12:11	12:59
40°	05:02	05:34	06:01	11:32	12:24	13:11
45°	04:56	05:31	06:00	11:46	12:39	13:26
S 50°	04:48	05:26	05:59	12:04	12:57	13:44
52°	04:44	05:24	05:58	12:12	13:06	13:53
54°	04:40	05:22	05:58	12:21	13:16	14:03
56°	04:35	05:20	05:57	12:32	13:27	14:13
58°	04:29	05:17	05:56	12:44	13:39	14:26
S 60°	04:23	05:14	05:55	12:58	13:54	14:40
S 62°	04:15	05:10	05:54	13:14	14:12	14:58

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 17	Moonset 18	Moonset 19
N 72°	18:10	19:18	20:47	-	-	-
N 70°	18:10	19:12	20:29	02:42	-	-
68°	18:10	19:06	20:15	01:52	03:09	04:04
66°	18:10	19:01	20:04	01:21	02:30	03:23
64°	18:10	18:58	19:55	00:58	02:03	02:55
62°	18:10	18:54	19:48	00:39	01:42	02:34
60°	18:10	18:52	19:41	00:24	01:25	02:16
N 58°	18:10	18:49	19:36	00:11	01:11	02:02
56°	18:10	18:47	19:31	-	00:59	01:49
54°	18:10	18:45	19:27	-	00:48	01:38
52°	18:10	18:44	19:23	-	00:38	01:29
50°	18:10	18:42	19:20	-	00:30	01:20
45°	18:10	18:39	19:14	-	00:12	01:02
N 40°	18:10	18:37	19:09	23:57	-	00:47
35°	18:10	18:35	19:05	23:45	-	00:34
30°	18:10	18:34	19:02	23:34	-	00:23
20°	18:10	18:32	18:58	23:15	-	00:04
N 10°	18:11	18:32	18:56	22:59	23:48	24:35
0°	18:11	18:32	18:56	22:44	23:32	24:20
S 10°	18:12	18:33	18:57	22:29	23:17	24:05
20°	18:12	18:34	19:00	22:13	23:00	23:49
30°	18:13	18:37	19:05	21:54	22:41	23:30
35°	18:14	18:39	19:09	21:43	22:30	23:20
40°	18:15	18:42	19:13	21:31	22:17	23:07
45°	18:15	18:45	19:19	21:16	22:02	22:53
S 50°	18:16	18:49	19:27	20:58	21:44	22:34
52°	18:17	18:50	19:30	20:50	21:35	22:26
54°	18:17	18:53	19:35	20:41	21:25	22:16
56°	18:18	18:55	19:39	20:30	21:14	22:06
58°	18:19	18:58	19:45	20:18	21:01	21:53
S 60°	18:19	19:01	19:51	20:04	20:46	21:39
S 62°	18:20	19:04	19:58	19:47	20:29	21:22

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
17	8 26	8 17	12:08	16:32	04:08	6d 30%
18	8 09	8 00	12:08	17:21	04:56	7d 39%
19	7 51	7 42	12:08	18:09	05:45	8d 48%

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2013 March 20, 21, 22 (Wed, Thur, Fri)

GMT		ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.2		SATURN +0.3	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
20 Wednesday	00	177° 41'.5	179° 33'.9	2° 21'.7 S	171° 54'.8	1° 45'.1 N	109° 15'.3	21° 31'.6 N	318° 27'.8	12° 34'.1 S
	01	192° 43'.9	194° 33'.5	20'.4	186° 55'.5	45'.9	124° 17'.4	31'.7	333° 30'.4	34'.1
	02	207° 46'.4	209° 33'.1	19'.2	201° 56'.2	46'.7	139° 19'.5	31'.7	348° 32'.9	34'.1
	03	222° 48'.9	224° 32'.7	17'.9	216° 56'.9	47'.5	154° 21'.6	31'.8	3° 35'.5	34'.0
	04	237° 51'.3	239° 32'.3	16'.7	231° 57'.6	48'.3	169° 23'.7	31'.8	18° 38'.1	34'.0
	05	252° 53'.8	254° 32'.0	15'.4	246° 58'.3	49'.1	184° 25'.7	31'.9	33° 40'.7	33'.9
	06	267° 56'.2	269° 31'.6	14'.2	261° 59'.0	49'.9	199° 27'.8	32'.0	48° 43'.2	33'.9
	07	282° 58'.7	284° 31'.2	12'.9	276° 59'.7	50'.6	214° 29'.9	32'.0	63° 45'.8	33'.8
	08	298° 01'.2	299° 30'.8	11'.7	292° 00'.4	51'.4	229° 32'.0	32'.1	78° 48'.4	33'.8
	09	313° 03'.6	314° 30'.4	10'.4	307° 01'.1	52'.2	244° 34'.1	32'.1	93° 51'.0	33'.7
	10	328° 06'.1	329° 30'.0	09'.2	322° 01'.8	53'.0	259° 36'.2	32'.2	108° 53'.5	33'.7
	11	343° 08'.6	344° 29'.6	07'.9	337° 02'.5	53'.8	274° 38'.3	32'.3	123° 56'.1	33'.7
	12	358° 11'.0	359° 29'.2	2° 06'.7 S	352° 03'.2	1° 54'.6 N	289° 40'.4	21° 32'.3 N	138° 58'.7	12° 33'.6 S
	13	13° 13'.5	14° 28'.9	05'.4	7° 03'.9	55'.4	304° 42'.4	32'.4	154° 01'.3	33'.6
	14	28° 16'.0	29° 28'.5	04'.2	22° 04'.6	56'.1	319° 44'.5	32'.4	169° 03'.9	33'.5
	15	43° 18'.4	44° 28'.1	02'.9	37° 05'.3	56'.9	334° 46'.6	32'.5	184° 06'.4	33'.5
	16	58° 20'.9	59° 27'.7	01'.7	52° 06'.0	57'.7	349° 48'.7	32'.6	199° 09'.0	33'.4
	17	73° 23'.4	74° 27'.3	00'.4	67° 06'.7	58'.5	4° 50'.8	32'.6	214° 11'.6	33'.4
	18	88° 25'.8	89° 26'.9	1° 59'.1 S	82° 07'.4	59'.3	19° 52'.9	32'.7	229° 14'.2	33'.4
	19	103° 28'.3	104° 26'.5	57'.9	97° 08'.1	2° 00'.1 N	34° 55'.0	32'.7	244° 16'.7	33'.3
	20	118° 30'.7	119° 26'.2	56'.6	112° 08'.8	00'.8	49° 57'.0	32'.8	259° 19'.3	33'.3
	21	133° 33'.2	134° 25'.8	55'.4	127° 09'.5	01'.6	64° 59'.1	32'.8	274° 21'.9	33'.2
	22	148° 35'.7	149° 25'.4	54'.1	142° 10'.2	02'.4	80° 01'.2	32'.9	289° 24'.5	33'.2
	23	163° 38'.1	164° 25'.0	52'.9	157° 10'.9	03'.2	95° 03'.3	33'.0	304° 27'.1	33'.1
21 Thursday	00	178° 40'.6	179° 24'.6	1° 51'.6 S	172° 11'.6	2° 04'.0 N	110° 05'.4	21° 33'.0 N	319° 29'.6	12° 33'.1 S
	01	193° 43'.1	194° 24'.2	50'.4	187° 12'.3	04'.8	125° 07'.5	33'.1	334° 32'.2	33'.0
	02	208° 45'.5	209° 23'.9	49'.1	202° 13'.0	05'.6	140° 09'.5	33'.1	349° 34'.8	33'.0
	03	223° 48'.0	224° 23'.5	47'.9	217° 13'.7	06'.3	155° 11'.6	33'.2	4° 37'.4	33'.0
	04	238° 50'.5	239° 23'.1	46'.6	232° 14'.4	07'.1	170° 13'.7	33'.3	19° 40'.0	32'.9
	05	253° 52'.9	254° 22'.7	45'.4	247° 15'.1	07'.9	185° 15'.8	33'.3	34° 42'.5	32'.9
	06	268° 55'.4	269° 22'.3	44'.1	262° 15'.8	08'.7	200° 17'.9	33'.4	49° 45'.1	32'.8
	07	283° 57'.9	284° 21'.9	42'.9	277° 16'.5	09'.5	215° 20'.0	33'.4	64° 47'.7	32'.8
	08	299° 00'.3	299° 21'.6	41'.6	292° 17'.2	10'.3	230° 22'.0	33'.5	79° 50'.3	32'.7
	09	314° 02'.8	314° 21'.2	40'.3	307° 17'.9	11'.0	245° 24'.1	33'.6	94° 52'.9	32'.7
	10	329° 05'.2	329° 20'.8	39'.1	322° 18'.6	11'.8	260° 26'.2	33'.6	109° 55'.4	32'.6
	11	344° 07'.7	344° 20'.4	37'.8	337° 19'.3	12'.6	275° 28'.3	33'.7	124° 58'.0	32'.6
	12	359° 10'.2	359° 20'.0	1° 36'.6 S	352° 20'.0	2° 13'.4 N	290° 30'.4	21° 33'.7 N	140° 00'.6	12° 32'.6 S
	13	14° 12'.6	14° 19'.6	35'.3	7° 20'.7	14'.2	305° 32'.5	33'.8	155° 03'.2	32'.5
	14	29° 15'.1	29° 19'.2	34'.1	22° 21'.4	15'.0	320° 34'.5	33'.9	170° 05'.8	32'.5
	15	44° 17'.6	44° 18'.9	32'.8	37° 22'.1	15'.7	335° 36'.6	33'.9	185° 08'.4	32'.4
	16	59° 20'.0	59° 18'.5	31'.6	52° 22'.8	16'.5	350° 38'.7	34'.0	200° 10'.9	32'.4
	17	74° 22'.5	74° 18'.1	30'.3	67° 23'.5	17'.3	5° 40'.8	34'.0	215° 13'.5	32'.3
	18	89° 25'.0	89° 17'.7	29'.1	82° 24'.2	18'.1	20° 42'.9	34'.1	230° 16'.1	32'.3
	19	104° 27'.4	104° 17'.3	27'.8	97° 24'.9	18'.9	35° 44'.9	34'.2	245° 18'.7	32'.2
	20	119° 29'.9	119° 17'.0	26'.5	112° 25'.6	19'.7	50° 47'.0	34'.2	260° 21'.3	32'.2
	21	134° 32'.3	134° 16'.6	25'.3	127° 26'.3	20'.4	65° 49'.1	34'.3	275° 23'.8	32'.2
	22	149° 34'.8	149° 16'.2	24'.0	142° 27'.0	21'.2	80° 51'.2	34'.3	290° 26'.4	32'.1
	23	164° 37'.3	164° 15'.8	22'.8	157° 27'.7	22'.0	95° 53'.2	34'.4	305° 29'.0	32'.1
22 Friday	00	179° 39'.7	179° 15'.4	1° 21'.5 S	172° 28'.4	2° 22'.8 N	110° 55'.3	21° 34'.5 N	320° 31'.6	12° 32'.0 S
	01	194° 42'.2	194° 15'.0	20'.3	187° 29'.0	23'.6	125° 57'.4	34'.5	335° 34'.2	32'.0
	02	209° 44'.7	209° 14'.7	19'.0	202° 29'.7	24'.4	140° 59'.5	34'.6	350° 36'.8	31'.9
	03	224° 47'.1	224° 14'.3	17'.8	217° 30'.4	25'.1	156° 01'.6	34'.6	5° 39'.3	31'.9
	04	239° 49'.6	239° 13'.9	16'.5	232° 31'.1	25'.9	171° 03'.6	34'.7	20° 41'.9	31'.8
	05	254° 52'.1	254° 13'.5	15'.2	247° 31'.8	26'.7	186° 05'.7	34'.8	35° 44'.5	31'.8
	06	269° 54'.5	269° 13'.1	14'.0	262° 32'.5	27'.5	201° 07'.8	34'.8	50° 47'.1	31'.8
	07	284° 57'.0	284° 12'.7	12'.7	277° 33'.2	28'.3	216° 09'.9	34'.9	65° 49'.7	31'.7
	08	299° 59'.5	299° 12'.4	11'.5	292° 33'.9	29'.1	231° 11'.9	34'.9	80° 52'.3	31'.7
	09	315° 01'.9	314° 12'.0	10'.2	307° 34'.6	29'.8	246° 14'.0	35'.0	95° 54'.8	31'.6
	10	330° 04'.4	329° 11'.6	09'.0	322° 35'.3	30'.6	261° 16'.1	35'.1	110° 57'.4	31'.6
	11	345° 06'.8	344° 11'.2	07'.7	337° 36'.0	31'.4	276° 18'.2	35'.1	126° 00'.0	31'.5
	12	0° 09'.3	359° 10'.8	1° 06'.5 S	352° 36'.7	2° 32'.2 N	291° 20'.2	21° 35'.2 N	141° 02'.6	12° 31'.5 S
	13	15° 11'.8	14° 10'.5	05'.2	7° 37'.4	33'.0	306° 22'.3	35'.2	156° 05'.2	31'.4
	14	30° 14'.2	29° 10'.1	03'.9	22° 38'.1	33'.7	321° 24'.4	35'.3	171° 07'.8	31'.4
	15	45° 16'.7	44° 09'.7	02'.7	37° 38'.8	34'.5	336° 26'.5	35'.4	186° 10'.3	31'.3
	16	60° 19'.2	59° 09'.3	01'.4	52° 39'.5	35'.3	351° 28'.5	35'.4	201° 12'.9	31'.3
	17	75° 21'.6	74° 08'.9	00'.2	67° 40'.2	36'.1	6° 30'.6	35'.5	216° 15'.5	31'.3
	18	90° 24'.1	89° 08'.6	0° 58'.9 S	82° 40'.9	36'.9	21° 32'.7	35'.5	231° 18'.1	31'.2
	19	105° 26'.6	104° 08'.2	57'.7	97° 41'.6	37'.7	36° 34'.8	35'.6	246° 20'.7	31'.2
	20	120° 29'.0	119° 07'.8	56'.4	112° 42'.3	38'.4	51° 36'.8	35'.7	261° 23'.3	31'.1
	21	135° 31'.5	134° 07'.4	55'.1	127° 43'.0	39'.2	66° 38'.9	35'.7	276° 25'.9	31'.1
	22	150° 34'.0	149° 07'.0	53'.9	142° 43'.7	40'.0	81° 41'.0	35'.8	291° 28'.4	31'.0
	23	165° 36'.4	164° 06'.7	52'.6	157° 44'.4	40'.8	96° 43'.1	35'.8	306° 31'.0	31'.0
		M.P. 12:03	v -0'.4	d 1'.3	v 0'.7	d 0'.8	v 2'.1	d 0'.1	v 2'.6	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.4 S
Achernar	335° 27'.4	57° 10'.3 S
Acrux	173° 08'.8	63° 10'.4 S
Adhara	255° 12'.6	28° 59'.8 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.1 N
Alkaid	152° 58'.6	49° 14'.6 N
Alnair	27° 44'.3	46° 53'.7 S
Alnilam	275° 46'.6	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 10'.9	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.5	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.1 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.6 N
Atria	107° 28'.1	69° 02'.7 S
Avior	234° 17'.7	59° 33'.6 S
Bellatrix	278° 32'.2	6° 21'.5 N
Betelgeuse	271° 01'.5	7° 24'.3 N
Canopus	263° 56'.2	52° 42'.6 S
Capella	280° 34'.8	46° 00'.7 N
Deneb	49° 31'.8	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 54'.9 S
Dubhe	193° 51'.3	61° 40'.7 N
Elnath	278° 12'.9	28° 37'.0 N
Eltanin	90° 46'.2	51° 29'.0 N
Enif	33° 47'.5	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.5	57° 11'.3 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.5	60° 26'.1 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 44'.0	34° 22'.5 S
Kochab	137° 19'.2	74° 05'.8 N
Markab	13° 38'.8	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.4	36° 26'.1 S
Miaplacidus	221° 39'.0	69° 46'.7 S
Mirfak	308° 40'.9	49° 54'.5 N
Nunki	75° 58'.6	26° 16'.6 S
Peacock	53° 19'.8	56° 41'.2 S
Polaris	318° 11'.0	89° 19'.4 N
Pollux	243° 27'.8	27° 59'.5 N
Procyon	244° 59'.8	5° 11'.2 N
Rasalhague	96° 06'.6	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.3	8° 11'.5 S
Rigil Kent	139° 51'.4	60° 53'.2 S
Sabik	102° 12'.6	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.6 N
Shaula	96° 22'.1	37° 06'.6 S
Sirius	258° 33'.8	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.2	43° 29'.6 S
Vega	80° 39'.1	38° 47'.6 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	0° 44'.0	12:03
Mars	353° 31'.0	12:31
Jupiter	291° 24'.8	16:37
Saturn	140° 49'.0	02:42

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 06'.7	0° 10'.9 S	85° 01'.8	12'.0	19° 47'.9 N	2'.5	54'.3
193° 06'.9	09'.9	99° 32'.8	12'.1	45'.4	2'.6	
208° 07'.1	08'.9	114° 03'.9	12'.1	42'.8	2'.6	
223° 07'.3	07'.9	128° 35'.0	12'.1	40'.2	2'.8	
238° 07'.4	06'.9	143° 06'.1	12'.1	37'.4	2'.9	
253° 07'.6	06'.0	157° 37'.2	12'.1	34'.5	2'.9	
268° 07'.8	05'.0	172° 08'.3	12'.1	31'.6	3'.1	
283° 08'.0	04'.0	186° 39'.4	12'.1	28'.5	3'.1	54'.4
298° 08'.2	03'.0	201° 10'.5	12'.1	25'.4	3'.2	
313° 08'.4	02'.0	215° 41'.6	12'.2	22'.2	3'.3	
328° 08'.5	01'.0	230° 12'.8	12'.1	18'.9	3'.4	
343° 08'.7	00'.0	244° 43'.9	12'.2	15'.5	3'.5	
358° 08'.9	0° 01'.0 N	259° 15'.1	12'.2	19° 12'.0 N	3'.6	54'.4
13° 09'.1	01'.9	273° 46'.3	12'.2	08'.4	3'.7	
28° 09'.3	02'.9	288° 17'.5	12'.2	04'.7	3'.8	
43° 09'.5	03'.9	302° 48'.7	12'.2	00'.9	3'.8	
58° 09'.7	04'.9	317° 19'.9	12'.2	18° 57'.1 N	4'.0	
73° 09'.8	05'.9	331° 51'.1	12'.2	53'.1	4'.0	54'.5
88° 10'.0	06'.9	346° 22'.3	12'.2	49'.1	4'.1	
103° 10'.2	07'.9	0° 53'.5	12'.3	45'.0	4'.2	
118° 10'.4	08'.9	15° 24'.8	12'.3	40'.8	4'.3	
133° 10'.6	09'.8	29° 56'.1	12'.2	36'.5	4'.4	
148° 10'.8	10'.8	44° 27'.3	12'.3	32'.1	4'.5	
163° 11'.0	11'.8	58° 58'.6	12'.3	27'.6	4'.5	
178° 11'.1	0° 12'.8 N	73° 29'.9	12'.3	18° 23'.1 N	4'.7	54'.5
193° 11'.3	13'.8	88° 01'.2	12'.3	18'.4	4'.7	54'.6
208° 11'.5	14'.8	102° 32'.5	12'.3	13'.7	4'.8	
223° 11'.7	15'.8	117° 03'.8	12'.4	08'.9	4'.9	
238° 11'.9	16'.8	131° 35'.2	12'.3	04'.0	5'.0	
253° 12'.1	17'.7	146° 06'.5	12'.4	17° 59'.0 N	5'.1	
268° 12'.3	18'.7	160° 37'.9	12'.4	53'.9	5'.1	
283° 12'.5	19'.7	175° 09'.3	12'.3	48'.8	5'.3	
298° 12'.6	20'.7	189° 40'.6	12'.4	43'.5	5'.3	54'.7
313° 12'.8	21'.7	204° 12'.0	12'.4	38'.2	5'.4	
328° 13'.0	22'.7	218° 43'.4	12'.4	32'.8	5'.5	
343° 13'.2	23'.7	233° 14'.8	12'.5	27'.3	5'.6	
358° 13'.4	0° 24'.7 N	247° 46'.3	12'.4	17° 21'.7 N	5'.7	54'.7
13° 13'.6	25'.6	262° 17'.7	12'.5	16'.0	5'.7	
28° 13'.8	26'.6	276° 49'.2	12'.4	10'.3	5'.9	54'.8
43° 13'.9	27'.6	291° 20'.6	12'.5	04'.4	5'.9	
58° 14'.1	28'.6	305° 52'.1	12'.5	16° 58'.5 N	6'.0	
73° 14'.3	29'.6	320° 23'.6	12'.5	52'.5	6'.0	
88° 14'.5	30'.6	334° 55'.1	12'.5	46'.5	6'.2	
103° 14'.7	31'.6	349° 26'.6	12'.5	40'.3	6'.2	54'.9
118° 14'.9	32'.5	3° 58'.1	12'.5	34'.1	6'.4	
133° 15'.1	33'.5	18° 29'.6	12'.5	27'.7	6'.4	
148° 15'.3	34'.5	33° 01'.1	12'.6	21'.3	6'.4	
163° 15'.4	35'.5	47° 32'.7	12'.5	14'.9	6'.6	
178° 15'.6	0° 36'.5 N	62° 04'.2	12'.6	16° 08'.3 N	6'.6	54'.9
193° 15'.8	37'.5	76° 35'.8	12'.5	01'.7	6'.8	55'.0
208° 16'.0	38'.5	91° 07'.3	12'.6	15° 54'.9 N	6'.8	
223° 16'.2	39'.5	105° 38'.9	12'.6	48'.1	6'.8	
238° 16'.4	40'.4	120° 10'.5	12'.6	41'.3	7'.0	
253° 16'.6	41'.4	134° 42'.1	12'.6	34'.3	7'.0	
268° 16'.8	42'.4	149° 13'.7	12'.6	27'.3	7'.1	55'.1
283° 16'.9	43'.4	163° 45'.3	12'.7	20'.2	7'.2	
298° 17'.1	44'.4	178° 17'.0	12'.6	13'.0	7'.3	
313° 17'.3	45'.4	192° 48'.6	12'.7	05'.7	7'.3	
328° 17'.5	46'.4	207° 20'.3	12'.6	14° 58'.4 N	7'.4	55'.2
343° 17'.7	47'.3	221° 51'.9	12'.7	51'.0	7'.5	
358° 17'.9	0° 48'.3 N	236° 23'.6	12'.6	14° 43'.5 N	7'.6	55'.2
13° 18'.1	49'.3	250° 55'.2	12'.7	35'.9	7'.6	
28° 18'.3	50'.3	265° 26'.9	12'.7	28'.3	7'.7	
43° 18'.4	51'.3	279° 58'.6	12'.7	20'.6	7'.8	55'.3
58° 18'.6	52'.3	294° 30'.3	12'.7	12'.8	7'.9	
73° 18'.8	53'.3	309° 02'.0	12'.7	04'.9	7'.9	
88° 19'.0	54'.2	323° 33'.7	12'.7	13° 57'.0 N	8'.0	
103° 19'.2	55'.2	338° 05'.4	12'.7	49'.0	8'.1	55'.4
118° 19'.4	56'.2	352° 37'.1	12'.7	40'.9	8'.1	
133° 19'.6	57'.2	7° 08'.8	12'.7	32'.8	8'.2	
148° 19'.8	58'.2	21° 40'.5	12'.8	24'.6	8'.3	
163° 20'.0	59'.2	36° 12'.3	12'.7	16'.3	8'.3	55'.5
SD 16'.1	d 1'.0	SD	14'.8	14'.9	15'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 20	Moonrise 21	Moonrise 22
N 72°	03:14	04:44	05:53	-	08:11	10:34
N 70°	03:34	04:53	05:54	07:35	09:24	11:08
68°	03:49	04:59	05:55	08:36	10:01	11:32
66°	04:01	05:05	05:56	09:11	10:27	11:50
64°	04:11	05:09	05:57	09:36	10:47	12:05
62°	04:20	05:13	05:58	09:55	11:03	12:18
60°	04:27	05:17	05:58	10:11	11:17	12:28
N 58°	04:33	05:20	05:59	10:25	11:28	12:38
56°	04:38	05:22	05:59	10:36	11:38	12:46
54°	04:43	05:25	06:00	10:46	11:47	12:53
52°	04:47	05:27	06:00	10:55	11:55	12:59
50°	04:50	05:28	06:01	11:03	12:02	13:05
45°	04:58	05:32	06:01	11:21	12:17	13:17
N 40°	05:03	05:35	06:02	11:35	12:30	13:27
35°	05:08	05:37	06:02	11:47	12:40	13:36
30°	05:11	05:39	06:03	11:57	12:50	13:44
20°	05:16	05:41	06:03	12:15	13:05	13:57
N 10°	05:18	05:43	06:04	12:30	13:19	14:08
0°	05:19	05:43	06:04	12:45	13:32	14:19
S 10°	05:19	05:43	06:04	12:59	13:45	14:30
20°	05:17	05:42	06:04	13:15	13:59	14:41
30°	05:12	05:40	06:04	13:33	14:15	14:54
35°	05:09	05:39	06:04	13:43	14:24	15:02
40°	05:05	05:37	06:04	13:55	14:34	15:10
45°	05:00	05:34	06:04	14:09	14:46	15:20
S 50°	04:53	05:31	06:03	14:26	15:01	15:32
52°	04:50	05:30	06:03	14:34	15:08	15:38
54°	04:46	05:28	06:03	14:42	15:16	15:44
56°	04:42	05:26	06:03	14:52	15:24	15:51
58°	04:37	05:24	06:03	15:04	15:34	15:58
S 60°	04:31	05:21	06:03	15:17	15:45	16:07
S 62°	04:24	05:18	06:02	15:32	15:58	16:17

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 20	Moonset 21	Moonset 22
N 72°	18:24	19:33	21:06	-	06:39	05:54
N 70°	18:22	19:24	20:45	05:35	05:25	05:19
68°	18:21	19:17	20:28	04:34	04:48	04:54
66°	18:20	19:12	20:16	03:59	04:21	04:35
64°	18:19	19:07	20:05	03:34	04:00	04:19
62°	18:18	19:03	19:57	03:14	03:44	04:06
60°	18:17	18:59	19:49	02:58	03:30	03:55
N 58°	18:17	18:56	19:43	02:44	03:18	03:45
56°	18:16	18:53	19:38	02:32	03:07	03:36
54°	18:16	18:51	19:33	02:22	02:58	03:29
52°	18:15	18:49	19:29	02:13	02:50	03:22
50°	18:15	18:47	19:25	02:04	02:43	03:16
45°	18:14	18:43	19:18	01:47	02:27	03:03
N 40°	18:13	18:40	19:12	01:32	02:14	02:52
35°	18:13	18:38	19:07	01:20	02:03	02:42
30°	18:12	18:36	19:04	01:10	01:53	02:34
20°	18:11	18:33	18:59	00:51	01:36	02:19
N 10°	18:11	18:32	18:56	00:35	01:22	02:07
0°	18:10	18:31	18:55	00:20	01:08	01:55
S 10°	18:10	18:31	18:55	00:05	00:54	01:43
20°	18:10	18:32	18:57	-	00:39	01:30
30°	18:10	18:34	19:01	-	00:22	01:16
35°	18:10	18:35	19:04	-	00:12	01:07
40°	18:10	18:37	19:08	-	00:01	00:57
45°	18:10	18:39	19:13	23:47	-	00:46
S 50°	18:10	18:42	19:20	23:31	-	00:32
52°	18:10	18:43	19:23	23:23	-	00:25
54°	18:10	18:45	19:27	23:15	-	00:18
56°	18:10	18:47	19:31	23:05	-	00:10
58°	18:10	18:49	19:36	22:54	-	00:01
S 60°	18:10	18:52	19:41	22:41	23:50	25:04
S 62°	18:10	18:54	19:48	22:26	23:38	24:55

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
20	7 34	7 25	12:07	18:56	06:32	9d 57%
21	7 16	7 07	12:07	19:44	07:20	10d 67%
22	6 58	6 49	12:07	20:30	08:07	11d 75%

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2013 March 23, 24, 25 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.2		SATURN +0.3	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
23 Saturday 00	180° 38'.9	179° 06'.3	0° 51'.4 S	172° 45'.1	2° 41'.6 N	111° 45'.1	21° 35'.9 N	321° 33'.6	12° 30'.9 S
01	195° 41'.3	194° 05'.9	50'.1	187° 45'.8	42'.3	126° 47'.2	36'.0	336° 36'.2	30'.9
02	210° 43'.8	209° 05'.5	48'.9	202° 46'.5	43'.1	141° 49'.3	36'.0	351° 38'.8	30'.8
03	225° 46'.3	224° 05'.1	47'.6	217° 47'.2	43'.9	156° 51'.3	36'.1	6° 41'.4	30'.8
04	240° 48'.7	239° 04'.8	46'.3	232° 47'.9	44'.7	171° 53'.4	36'.1	21° 44'.0	30'.7
05	255° 51'.2	254° 04'.4	45'.1	247° 48'.6	45'.5	186° 55'.5	36'.2	36° 46'.6	30'.7
06	270° 53'.7	269° 04'.0	43'.8	262° 49'.3	46'.2	201° 57'.6	36'.3	51° 49'.1	30'.7
07	285° 56'.1	284° 03'.6	42'.6	277° 50'.0	47'.0	216° 59'.6	36'.3	66° 51'.7	30'.6
08	300° 58'.6	299° 03'.2	41'.3	292° 50'.7	47'.8	232° 01'.7	36'.4	81° 54'.3	30'.6
09	316° 01'.1	314° 02'.9	40'.1	307° 51'.4	48'.6	247° 03'.8	36'.4	96° 56'.9	30'.5
10	331° 03'.5	329° 02'.5	38'.8	322° 52'.1	49'.4	262° 05'.8	36'.5	111° 59'.5	30'.5
11	346° 06'.0	344° 02'.1	37'.5	337° 52'.8	50'.2	277° 07'.9	36'.6	127° 02'.1	30'.4
12	1° 08'.4	359° 01'.7	0° 36'.3 S	352° 53'.5	2° 50'.9 N	292° 10'.0	21° 36'.6 N	142° 04'.7	12° 30'.4 S
13	16° 10'.9	14° 01'.3	35'.0	7° 54'.2	51'.7	307° 12'.1	36'.7	157° 07'.2	30'.3
14	31° 13'.4	29° 01'.0	33'.8	22° 54'.9	52'.5	322° 14'.1	36'.7	172° 09'.8	30'.3
15	46° 15'.8	44° 00'.6	32'.5	37° 55'.6	53'.3	337° 16'.2	36'.8	187° 12'.4	30'.2
16	61° 18'.3	59° 00'.2	31'.2	52° 56'.3	54'.1	352° 18'.3	36'.9	202° 15'.0	30'.2
17	76° 20'.8	73° 59'.8	30'.0	67° 57'.0	54'.8	7° 20'.3	36'.9	217° 17'.6	30'.1
18	91° 23'.2	88° 59'.4	28'.7	82° 57'.7	55'.6	22° 22'.4	37'.0	232° 20'.2	30'.1
19	106° 25'.7	103° 59'.1	27'.5	97° 58'.4	56'.4	37° 24'.5	37'.0	247° 22'.8	30'.1
20	121° 28'.2	118° 58'.7	26'.2	112° 59'.1	57'.2	52° 26'.5	37'.1	262° 25'.4	30'.0
21	136° 30'.6	133° 58'.3	25'.0	127° 59'.8	57'.9	67° 28'.6	37'.2	277° 28'.0	30'.0
22	151° 33'.1	148° 57'.9	23'.7	143° 00'.5	58'.7	82° 30'.7	37'.2	292° 30'.5	29'.9
23	166° 35'.6	163° 57'.5	22'.4	158° 01'.2	59'.5	97° 32'.7	37'.3	307° 33'.1	29'.9
24 Sunday 00	181° 38'.0	178° 57'.2	0° 21'.2 S	173° 01'.9	3° 00'.3 N	112° 34'.8	21° 37'.3 N	322° 35'.7	12° 29'.8 S
01	196° 40'.5	193° 56'.8	19'.9	188° 02'.6	01'.1	127° 36'.9	37'.4	337° 38'.3	29'.8
02	211° 42'.9	208° 56'.4	18'.7	203° 03'.3	01'.8	142° 38'.9	37'.5	352° 40'.9	29'.7
03	226° 45'.4	223° 56'.0	17'.4	218° 04'.0	02'.6	157° 41'.0	37'.5	7° 43'.5	29'.7
04	241° 47'.9	238° 55'.7	16'.1	233° 04'.7	03'.4	172° 43'.1	37'.6	22° 46'.1	29'.6
05	256° 50'.3	253° 55'.3	14'.9	248° 05'.4	04'.2	187° 45'.1	37'.6	37° 48'.7	29'.6
06	271° 52'.8	268° 54'.9	13'.6	263° 06'.1	05'.0	202° 47'.2	37'.7	52° 51'.3	29'.5
07	286° 55'.3	283° 54'.5	12'.4	278° 06'.8	05'.7	217° 49'.3	37'.8	67° 53'.8	29'.5
08	301° 57'.7	298° 54'.1	11'.1	293° 07'.5	06'.5	232° 51'.3	37'.8	82° 56'.4	29'.4
09	317° 00'.2	313° 53'.8	09'.9	308° 08'.2	07'.3	247° 53'.4	37'.9	97° 59'.0	29'.4
10	332° 02'.7	328° 53'.4	08'.6	323° 08'.9	08'.1	262° 55'.5	37'.9	113° 01'.6	29'.4
11	347° 05'.1	343° 53'.0	07'.3	338° 09'.6	08'.9	277° 57'.5	38'.0	128° 04'.2	29'.3
12	2° 07'.6	358° 52'.6	0° 06'.1 S	353° 10'.3	3° 09'.6 N	292° 59'.6	21° 38'.1 N	143° 06'.8	12° 29'.3 S
13	17° 10'.1	13° 52'.3	04'.8	8° 11'.0	10'.4	308° 01'.7	38'.1	158° 09'.4	29'.2
14	32° 12'.5	28° 51'.9	03'.6	23° 11'.7	11'.2	323° 03'.7	38'.2	173° 12'.0	29'.2
15	47° 15'.0	43° 51'.5	02'.3	38° 12'.4	12'.0	338° 05'.8	38'.2	188° 14'.6	29'.1
16	62° 17'.4	58° 51'.1	01'.0	53° 13'.1	12'.7	353° 07'.8	38'.3	203° 17'.2	29'.1
17	77° 19'.9	73° 50'.7	00'.2	68° 13'.8	13'.5	8° 09'.9	38'.4	218° 19'.8	29'.0
18	92° 22'.4	88° 50'.4	01'.5	83° 14'.5	14'.3	23° 12'.0	38'.4	233° 22'.3	29'.0
19	107° 24'.8	103° 50'.0	02'.7	98° 15'.2	15'.1	38° 14'.0	38'.5	248° 24'.9	28'.9
20	122° 27'.3	118° 49'.6	04'.0	113° 15'.9	15'.9	53° 16'.1	38'.5	263° 27'.5	28'.9
21	137° 29'.8	133° 49'.2	05'.3	128° 16'.6	16'.6	68° 18'.2	38'.6	278° 30'.1	28'.8
22	152° 32'.2	148° 48'.9	06'.5	143° 17'.3	17'.4	83° 20'.2	38'.7	293° 32'.7	28'.8
23	167° 34'.7	163° 48'.5	07'.8	158° 18'.0	18'.2	98° 22'.3	38'.7	308° 35'.3	28'.7
25 Monday 00	182° 37'.2	178° 48'.1	0° 09'.0 N	173° 18'.7	3° 19'.0 N	113° 24'.3	21° 38'.8 N	323° 37'.9	12° 28'.7 S
01	197° 39'.6	193° 47'.7	10'.3	188° 19'.4	19'.7	128° 26'.4	38'.8	338° 40'.5	28'.6
02	212° 42'.1	208° 47'.3	11'.5	203° 20'.1	20'.5	143° 28'.5	38'.9	353° 43'.1	28'.6
03	227° 44'.5	223° 47'.0	12'.8	218° 20'.8	21'.3	158° 30'.5	39'.0	8° 45'.7	28'.5
04	242° 47'.0	238° 46'.6	14'.1	233° 21'.5	22'.1	173° 32'.6	39'.0	23° 48'.3	28'.5
05	257° 49'.5	253° 46'.2	15'.3	248° 22'.2	22'.8	188° 34'.6	39'.1	38° 50'.9	28'.5
06	272° 51'.9	268° 45'.8	16'.6	263° 22'.9	23'.6	203° 36'.7	39'.1	53° 53'.4	28'.4
07	287° 54'.4	283° 45'.5	17'.8	278° 23'.6	24'.4	218° 38'.8	39'.2	68° 56'.0	28'.4
08	302° 56'.9	298° 45'.1	19'.1	293° 24'.3	25'.2	233° 40'.8	39'.3	83° 58'.6	28'.3
09	317° 59'.3	313° 44'.7	20'.4	308° 25'.0	26'.0	248° 42'.9	39'.3	99° 01'.2	28'.3
10	333° 01'.8	328° 44'.3	21'.6	323° 25'.7	26'.7	263° 44'.9	39'.4	114° 03'.8	28'.2
11	348° 04'.3	343° 43'.9	22'.9	338° 26'.4	27'.5	278° 47'.0	39'.5	129° 06'.4	28'.2
12	3° 06'.7	358° 43'.6	0° 24'.1 N	353° 27'.1	3° 28'.3 N	293° 49'.1	21° 39'.5 N	144° 09'.0	12° 28'.1 S
13	18° 09'.2	13° 43'.2	25'.4	8° 27'.8	29'.1	308° 51'.1	39'.6	159° 11'.6	28'.1
14	33° 11'.7	28° 42'.8	26'.7	23° 28'.5	29'.8	323° 53'.2	39'.6	174° 14'.2	28'.0
15	48° 14'.1	43° 42'.4	27'.9	38° 29'.2	30'.6	338° 55'.2	39'.7	189° 16'.8	28'.0
16	63° 16'.6	58° 42'.1	29'.2	53° 29'.9	31'.4	353° 57'.3	39'.8	204° 19'.4	27'.9
17	78° 19'.0	73° 41'.7	30'.4	68° 30'.6	32'.2	8° 59'.4	39'.8	219° 22'.0	27'.9
18	93° 21'.5	88° 41'.3	31'.7	83° 31'.3	32'.9	24° 01'.4	39'.9	234° 24'.6	27'.8
19	108° 24'.0	103° 40'.9	33'.0	98° 32'.0	33'.7	39° 03'.5	39'.9	249° 27'.2	27'.8
20	123° 26'.4	118° 40'.6	34'.2	113° 32'.7	34'.5	54° 05'.5	40'.0	264° 29'.8	27'.7
21	138° 28'.9	133° 40'.2	35'.5	128° 33'.4	35'.3	69° 07'.6	40'.1	279° 32'.4	27'.7
22	153° 31'.4	148° 39'.8	36'.7	143° 34'.1	36'.0	84° 09'.6	40'.1	294° 34'.9	27'.6
23	168° 33'.8	163° 39'.4	38'.0	158° 34'.8	36'.8	99° 11'.7	40'.2	309° 37'.5	27'.6
	M.P. 11:48	v -0'.4	d 1'.3	v 0'.7	d 0'.8	v 2'.1	d 0'.1	v 2'.6	d 0'.0

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 18'.8	40° 15'.4 S	178° 20'.1	1° 00'.2 N	50° 44'.0	12'.8	13° 08'.0 N	8'.5	55'.5
Achernar	335° 27'.4	57° 10'.3 S	193° 20'.3	01'.1	65° 15'.8	12'.7	12° 59'.5 N	8'.4	
Acrux	173° 08'.8	63° 10'.5 S	208° 20'.5	02'.1	79° 47'.5	12'.7	51'.1	8'.6	
Adhara	255° 12'.6	28° 59'.8 S	223° 20'.7	03'.1	94° 19'.2	12'.8	42'.5	8'.6	55'.6
Aldebaran	290° 49'.7	16° 32'.0 N	238° 20'.9	04'.1	108° 51'.0	12'.8	33'.9	8'.7	
			253° 21'.1	05'.1	123° 22'.8	12'.7	25'.2	8'.8	
Alioth	166° 20'.3	55° 53'.1 N	268° 21'.3	06'.1	137° 54'.5	12'.8	16'.4	8'.8	
Alkaid	152° 58'.6	49° 14'.6 N	283° 21'.5	07'.1	152° 26'.3	12'.7	07'.6	8'.9	55'.7
Alnair	27° 44'.3	46° 53'.6 S	298° 21'.7	08'.0	166° 58'.0	12'.8	11° 58'.7 N	8'.9	
Alnilam	275° 46'.6	1° 11'.9 S	313° 21'.8	09'.0	181° 29'.8	12'.8	49'.8	9'.0	
Alphard	217° 56'.0	8° 43'.3 S	328° 22'.0	10'.0	196° 01'.6	12'.7	40'.8	9'.1	55'.8
			343° 22'.2	11'.0	210° 33'.3	12'.8	31'.7	9'.2	
Alphecca	126° 10'.9	26° 40'.0 N	358° 22'.4	1° 12'.0 N	225° 05'.1	12'.8	11° 22'.5 N	9'.2	55'.8
Alpheratz	357° 44'.0	29° 09'.8 N	13° 22'.6	13'.0	239° 36'.9	12'.7	13'.3	9'.2	
Altair	62° 08'.5	8° 54'.2 N	28° 22'.8	13'.9	254° 08'.6	12'.8	04'.1	9'.4	55'.9
Ankaa	353° 16'.3	42° 14'.1 S	43° 23'.0	14'.9	268° 40'.4	12'.8	10° 54'.7 N	9'.3	
Antares	112° 26'.3	26° 27'.6 S	58° 23'.2	15'.9	283° 12'.2	12'.7	45'.4	9'.5	
			73° 23'.3	16'.9	297° 43'.9	12'.8	35'.9	9'.5	
Arcturus	145° 55'.6	19° 06'.6 N	88° 23'.5	17'.9	312° 15'.7	12'.8	26'.4	9'.6	56'.0
Atria	107° 28'.1	69° 02'.7 S	103° 23'.7	18'.9	326° 47'.5	12'.7	16'.8	9'.6	
Avior	234° 17'.7	59° 33'.6 S	118° 23'.9	19'.9	341° 19'.2	12'.8	07'.2	9'.7	
Bellatrix	278° 32'.2	6° 21'.5 N	133° 24'.1	20'.8	355° 51'.0	12'.7	9° 57'.5 N	9'.7	56'.1
Betelgeuse	271° 01'.5	7° 24'.3 N	148° 24'.3	21'.8	10° 22'.7	12'.8	47'.8	9'.8	
			163° 24'.5	22'.8	24° 54'.5	12'.7	38'.0	9'.9	
Canopus	263° 56'.2	52° 42'.6 S	178° 24'.7	1° 23'.8 N	39° 26'.2	12'.8	9° 28'.1 N	9'.9	56'.1
Capella	280° 34'.8	46° 00'.7 N	193° 24'.9	24'.8	53° 58'.0	12'.7	18'.2	9'.9	56'.2
Deneb	49° 31'.8	45° 19'.5 N	208° 25'.1	25'.8	68° 29'.7	12'.7	08'.3	10'.1	
Denebola	182° 33'.5	14° 29'.7 N	223° 25'.2	26'.7	83° 01'.4	12'.7	8° 58'.2 N	10'.0	
Diphda	348° 56'.4	17° 54'.9 S	238° 25'.4	27'.7	97° 33'.1	12'.8	48'.2	10'.2	56'.3
			253° 25'.6	28'.7	112° 04'.9	12'.7	38'.0	10'.1	
Dubhe	193° 51'.3	61° 40'.7 N	268° 25'.8	29'.7	126° 36'.6	12'.7	27'.9	10'.3	
Elnath	278° 12'.9	28° 37'.0 N	283° 26'.0	30'.7	141° 08'.3	12'.7	17'.6	10'.2	
Eltanin	90° 46'.2	51° 29'.0 N	298° 26'.2	31'.7	155° 40'.0	12'.6	07'.4	10'.4	56'.4
Enif	33° 47'.5	9° 56'.1 N	313° 26'.4	32'.6	170° 11'.6	12'.7	7° 57'.0 N	10'.3	
Fomalhaut	15° 24'.5	29° 33'.1 S	328° 26'.6	33'.6	184° 43'.3	12'.7	46'.7	10'.5	
			343° 26'.8	34'.6	199° 15'.0	12'.6	36'.2	10'.4	56'.5
Gacrux	172° 00'.5	57° 11'.4 S	358° 26'.9	1° 35'.6 N	213° 46'.6	12'.7	7° 25'.8 N	10'.6	56'.5
Gienah	175° 52'.1	17° 37'.1 S	13° 27'.1	36'.6	228° 18'.3	12'.6	15'.2	10'.5	
Hadar	148° 47'.5	60° 26'.1 S	28° 27'.3	37'.6	242° 49'.9	12'.6	04'.7	10'.6	56'.6
Hamal	328° 01'.2	23° 31'.4 N	43° 27'.5	38'.5	257° 21'.5	12'.7	6° 54'.1 N	10'.7	
Kaus Aust.	83° 44'.0	34° 22'.5 S	58° 27'.7	39'.5	271° 53'.2	12'.6	43'.4	10'.7	
			73° 27'.9	40'.5	286° 24'.8	12'.5	32'.7	10'.7	
Kochab	137° 19'.2	74° 05'.9 N	88° 28'.1	41'.5	300° 56'.3	12'.6	22'.0	10'.8	56'.7
Markab	13° 38'.8	15° 16'.6 N	103° 28'.3	42'.5	315° 27'.9	12'.6	11'.2	10'.9	
Menkar	314° 15'.4	4° 08'.3 N	118° 28'.5	43'.5	329° 59'.5	12'.5	00'.3	10'.8	
Menkent	148° 07'.4	36° 26'.1 S	133° 28'.7	44'.4	344° 31'.0	12'.5	5° 49'.5 N	10'.9	56'.8
Miaplacidus	221° 39'.0	69° 46'.7 S	148° 28'.8	45'.4	359° 02'.5	12'.5	38'.6	11'.0	
			163° 29'.0	46'.4	13° 34'.0	12'.5	27'.6	11'.0	
Mirfak	308° 40'.9	49° 54'.5 N	178° 29'.2	1° 47'.4 N	28° 05'.5	12'.5	5° 16'.6 N	11'.0	56'.9
Nunki	75° 58'.6	26° 16'.6 S	193° 29'.4	48'.4	42° 37'.0	12'.5	05'.6	11'.1	
Peacock	53° 19'.8	56° 41'.2 S	208° 29'.6	49'.4	57° 08'.5	12'.4	4° 54'.5 N	11'.1	
Polaris	318° 12'.0	89° 19'.4 N	223° 29'.8	50'.3	71° 39'.9	12'.4	43'.4	11'.1	57'.0
Pollux	243° 27'.8	27° 59'.5 N	238° 30'.0	51'.3	86° 11'.3	12'.4	32'.3	11'.2	
			253° 30'.2	52'.3	100° 42'.7	12'.4	21'.1	11'.2	
Procyon	244° 59'.8	5° 11'.2 N	268° 30'.4	53'.3	115° 14'.1	12'.4	09'.9	11'.2	
Rasalhague	96° 06'.5	12° 33'.0 N	283° 30'.5	54'.3	129° 45'.5	12'.3	3° 58'.7 N	11'.3	57'.1
Regulus	207° 43'.4	11° 53'.9 N	298° 30'.7	55'.2	144° 16'.8	12'.3	47'.4	11'.3	
Rigel	281° 12'.3	8° 11'.5 S	313° 30'.9	56'.2	158° 48'.1	12'.3	36'.1	11'.3	
Rigil Kent	139° 51'.3	60° 53'.2 S	328° 31'.1	57'.2	173° 19'.4	12'.3	24'.8	11'.4	57'.2
			343° 31'.3	58'.2	187° 50'.7	12'.3	13'.4	11'.4	
Sabik	102° 12'.6	15° 44'.4 S	358° 31'.5	1° 59'.2 N	202° 22'.0	12'.2	3° 02'.0 N	11'.4	57'.2
Schedar	349° 41'.2	56° 36'.6 N	13° 31'.7	2° 00'.2 N	216° 53'.2	12'.2	2° 50'.6 N	11'.4	57'.3
Shaula	96° 22'.0	37° 06'.6 S	28° 31'.9	01'.1	231° 24'.4	12'.2	39'.2	11'.5	
Sirius	258° 33'.8	16° 44'.4 S	43° 32'.1	02'.1	245° 55'.6	12'.1	27'.7	11'.5	
Spica	158° 31'.1	11° 14'.0 S	58° 32'.3	03'.1	260° 26'.7	12'.1	16'.2	11'.5	
			73° 32'.4	04'.1	274° 57'.8	12'.1	04'.7	11'.5	57'.4
Suhail	222° 52'.2	43° 29'.6 S	88° 32'.6	05'.1	289° 28'.9	12'.1	1° 53'.2 N	11'.6	
Vega	80° 39'.1	38° 47'.6 N	103° 32'.8	06'.0	304° 00'.0	12'.0	41'.6	11'.6	
Zuben'ubi	137° 05'.3	16° 05'.8 S	118° 33'.0	07'.0	318° 31'.0	12'.0	30'.0	11'.6	57'.5
			133° 33'.2	08'.0	333° 02'.0	12'.0	18'.4	11'.6	
	SHA	Mer.Pass.	148° 33'.4	09'.0	347° 33'.0	12'.0	06'.8	11'.6	
Venus	357° 19'.2	12:04	163° 33'.6	10'.0	2° 04'.0	11'.9	0° 55'.2 N	11'.7	57'.6
Mars	351° 23'.9	12:27							
Jupiter	290° 56'.8	16:27							
Saturn	140° 57'.7	02:29	SD 16'.0	d 1'.0	SD	15'.2	15'.4	15'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 23	Moonrise 24	Moonrise 25
N 72°	02:52	04:28	05:37	12:31	14:22	16:13
N 70°	03:16	04:38	05:40	12:50	14:33	16:16
68°	03:34	04:46	05:43	13:06	14:41	16:18
66°	03:48	04:53	05:45	13:18	14:48	16:20
64°	03:59	04:59	05:46	13:28	14:54	16:22
62°	04:09	05:03	05:48	13:37	14:59	16:24
60°	04:17	05:07	05:49	13:44	15:03	16:25
N 58°	04:24	05:11	05:50	13:51	15:07	16:26
56°	04:29	05:14	05:51	13:57	15:11	16:27
54°	04:35	05:17	05:52	14:02	15:14	16:28
52°	04:39	05:19	05:53	14:06	15:16	16:29
50°	04:43	05:22	05:54	14:11	15:19	16:30
45°	04:52	05:26	05:56	14:20	15:25	16:31
N 40°	04:58	05:30	05:57	14:27	15:29	16:33
35°	05:03	05:33	05:58	14:34	15:33	16:34
30°	05:07	05:35	05:59	14:39	15:36	16:35
20°	05:13	05:39	06:01	14:49	15:43	16:37
N 10°	05:16	05:41	06:02	14:58	15:48	16:38
0°	05:18	05:42	06:03	15:06	15:53	16:40
S 10°	05:19	05:43	06:04	15:14	15:58	16:42
20°	05:17	05:43	06:05	15:23	16:03	16:43
30°	05:14	05:42	06:06	15:32	16:09	16:45
35°	05:12	05:41	06:06	15:38	16:12	16:46
40°	05:08	05:40	06:07	15:44	16:16	16:48
45°	05:04	05:38	06:08	15:51	16:21	16:49
S 50°	04:58	05:36	06:08	16:00	16:26	16:51
52°	04:55	05:35	06:09	16:04	16:28	16:52
54°	04:52	05:34	06:09	16:09	16:31	16:52
56°	04:48	05:32	06:09	16:14	16:34	16:53
58°	04:44	05:30	06:10	16:19	16:37	16:54
S 60°	04:39	05:28	06:10	16:25	16:41	16:56
S 62°	04:33	05:26	06:10	16:32	16:45	16:57

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 23	Moonset 24	Moonset 25
N 72°	18:38	19:48	21:26	05:35	05:21	05:10
N 70°	18:35	19:37	21:01	05:14	05:09	05:04
68°	18:32	19:29	20:42	04:57	04:59	04:59
66°	18:30	19:22	20:28	04:44	04:50	04:55
64°	18:28	19:16	20:16	04:33	04:43	04:52
62°	18:26	19:11	20:06	04:23	04:37	04:49
60°	18:25	19:07	19:58	04:15	04:31	04:46
N 58°	18:23	19:03	19:51	04:07	04:27	04:44
56°	18:22	19:00	19:45	04:01	04:22	04:42
54°	18:21	18:57	19:39	03:55	04:18	04:40
52°	18:20	18:54	19:35	03:50	04:15	04:38
50°	18:19	18:52	19:30	03:45	04:12	04:37
45°	18:18	18:47	19:22	03:35	04:05	04:33
N 40°	18:16	18:43	19:15	03:26	03:59	04:31
35°	18:15	18:40	19:10	03:19	03:54	04:28
30°	18:14	18:38	19:06	03:12	03:50	04:26
20°	18:12	18:34	19:00	03:01	03:42	04:22
N 10°	18:11	18:32	18:56	02:51	03:35	04:18
0°	18:09	18:30	18:54	02:42	03:28	04:15
S 10°	18:08	18:29	18:54	02:32	03:22	04:12
20°	18:07	18:29	18:55	02:22	03:15	04:08
30°	18:06	18:30	18:58	02:10	03:07	04:04
35°	18:05	18:31	19:00	02:04	03:02	04:02
40°	18:05	18:32	19:03	01:56	02:57	03:59
45°	18:04	18:33	19:07	01:47	02:50	03:56
S 50°	18:03	18:35	19:13	01:36	02:43	03:52
52°	18:03	18:36	19:16	01:31	02:40	03:51
54°	18:02	18:38	19:19	01:25	02:36	03:49
56°	18:02	18:39	19:23	01:19	02:32	03:47
58°	18:02	18:41	19:27	01:12	02:27	03:44
S 60°	18:01	18:42	19:32	01:04	02:21	03:42
S 62°	18:01	18:45	19:37	00:55	02:15	03:39

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
23	6 40	6 31	12:07	21:17	08:54	12d 83%
24	6 22	6 13	12:06	22:04	09:40	13d 90%
25	6 04	5 54	12:06	22:51	10:28	14d 96%

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2013 March 26, 27, 28 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.1		SATURN +0.3	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
26 Tuesday 00	183° 36'.3	178° 39'.0	0° 39'.2 N	173° 35'.5	3° 37'.6 N	114° 13'.7	21° 40'.2 N	324° 40'.1	12° 27'.5 S
01	198° 38'.8	193° 38'.7	40'.5	188° 36'.2	38'.4	129° 15'.8	40'.3	339° 42'.7	27'.5
02	213° 41'.2	208° 38'.3	41'.8	203° 36'.9	39'.1	144° 17'.9	40'.4	354° 45'.3	27'.4
03	228° 43'.7	223° 37'.9	43'.0	218° 37'.6	39'.9	159° 19'.9	40'.4	9° 47'.9	27'.4
04	243° 46'.1	238° 37'.5	44'.3	233° 38'.3	40'.7	174° 22'.0	40'.5	24° 50'.5	27'.3
05	258° 48'.6	253° 37'.2	45'.5	248° 39'.0	41'.5	189° 24'.0	40'.5	39° 53'.1	27'.3
06	273° 51'.1	268° 36'.8	46'.8	263° 39'.7	42'.2	204° 26'.1	40'.6	54° 55'.7	27'.3
07	288° 53'.5	283° 36'.4	48'.1	278° 40'.4	43'.0	219° 28'.1	40'.7	69° 58'.3	27'.2
08	303° 56'.0	298° 36'.0	49'.3	293° 41'.1	43'.8	234° 30'.2	40'.7	85° 00'.9	27'.2
09	318° 58'.5	313° 35'.7	50'.6	308° 41'.8	44'.6	249° 32'.2	40'.8	100° 03'.5	27'.1
10	334° 00'.9	328° 35'.3	51'.8	323° 42'.5	45'.3	264° 34'.3	40'.9	115° 06'.1	27'.1
11	349° 03'.4	343° 34'.9	53'.1	338° 43'.2	46'.1	279° 36'.3	40'.9	130° 08'.7	27'.0
12	4° 05'.9	358° 34'.5	0° 54'.4 N	353° 43'.9	3° 46'.9 N	294° 38'.4	21° 41'.0 N	145° 11'.3	12° 27'.0 S
13	19° 08'.3	13° 34'.2	55'.6	8° 44'.6	47'.7	309° 40'.5	41'.0	160° 13'.9	26'.9
14	34° 10'.8	28° 33'.8	56'.9	23° 45'.3	48'.4	324° 42'.5	41'.1	175° 16'.5	26'.9
15	49° 13'.3	43° 33'.4	58'.1	38° 46'.0	49'.2	339° 44'.6	41'.2	190° 19'.1	26'.8
16	64° 15'.7	58° 33'.0	59'.4	53° 46'.7	50'.0	354° 46'.6	41'.2	205° 21'.7	26'.8
17	79° 18'.2	73° 32'.6	1° 00'.7 N	68° 47'.4	50'.8	9° 48'.7	41'.3	220° 24'.3	26'.7
18	94° 20'.6	88° 32'.3	01'.9	83° 48'.2	51'.5	24° 50'.7	41'.3	235° 26'.9	26'.7
19	109° 23'.1	103° 31'.9	03'.2	98° 48'.9	52'.3	39° 52'.8	41'.4	250° 29'.5	26'.6
20	124° 25'.6	118° 31'.5	04'.4	113° 49'.6	53'.1	54° 54'.8	41'.5	265° 32'.1	26'.6
21	139° 28'.0	133° 31'.1	05'.7	128° 50'.3	53'.8	69° 56'.9	41'.5	280° 34'.7	26'.5
22	154° 30'.5	148° 30'.8	07'.0	143° 51'.0	54'.6	84° 58'.9	41'.6	295° 37'.3	26'.5
23	169° 33'.0	163° 30'.4	08'.2	158° 51'.7	55'.4	100° 01'.0	41'.6	310° 39'.9	26'.4
27 Wednesday 00	184° 35'.4	178° 30'.0	1° 09'.5 N	173° 52'.4	3° 56'.2 N	115° 03'.0	21° 41'.7 N	325° 42'.5	12° 26'.4 S
01	199° 37'.9	193° 29'.6	10'.7	188° 53'.1	56'.9	130° 05'.1	41'.8	340° 45'.1	26'.3
02	214° 40'.4	208° 29'.3	12'.0	203° 53'.8	57'.7	145° 07'.1	41'.8	355° 47'.7	26'.3
03	229° 42'.8	223° 28'.9	13'.2	218° 54'.5	58'.5	160° 09'.2	41'.9	10° 50'.2	26'.2
04	244° 45'.3	238° 28'.5	14'.5	233° 55'.2	59'.3	175° 11'.2	41'.9	25° 52'.8	26'.2
05	259° 47'.7	253° 28'.1	15'.8	248° 55'.9	4° 00'.0 N	190° 13'.3	42'.0	40° 55'.4	26'.1
06	274° 50'.2	268° 27'.7	17'.0	263° 56'.6	00'.8	205° 15'.3	42'.1	55° 58'.0	26'.1
07	289° 52'.7	283° 27'.4	18'.3	278° 57'.3	01'.6	220° 17'.4	42'.1	71° 00'.6	26'.0
08	304° 55'.1	298° 27'.0	19'.5	293° 58'.0	02'.3	235° 19'.4	42'.2	86° 03'.2	26'.0
09	319° 57'.6	313° 26'.6	20'.8	308° 58'.7	03'.1	250° 21'.5	42'.3	101° 05'.8	25'.9
10	335° 00'.1	328° 26'.2	22'.1	323° 59'.4	03'.9	265° 23'.5	42'.3	116° 08'.4	25'.9
11	350° 02'.5	343° 25'.9	23'.3	339° 00'.1	04'.7	280° 25'.6	42'.4	131° 11'.0	25'.8
12	5° 05'.0	358° 25'.5	1° 24'.6 N	354° 00'.8	4° 05'.4 N	295° 27'.6	21° 42'.4 N	146° 13'.6	12° 25'.8 S
13	20° 07'.5	13° 25'.1	25'.8	9° 01'.5	06'.2	310° 29'.7	42'.5	161° 16'.2	25'.7
14	35° 09'.9	28° 24'.7	27'.1	24° 02'.2	07'.0	325° 31'.7	42'.6	176° 18'.8	25'.7
15	50° 12'.4	43° 24'.4	28'.4	39° 02'.9	07'.7	340° 33'.8	42'.6	191° 21'.4	25'.6
16	65° 14'.9	58° 24'.0	29'.6	54° 03'.6	08'.5	355° 35'.8	42'.7	206° 24'.0	25'.6
17	80° 17'.3	73° 23'.6	30'.9	69° 04'.3	09'.3	10° 37'.8	42'.7	221° 26'.6	25'.5
18	95° 19'.8	88° 23'.2	32'.1	84° 05'.0	10'.1	25° 39'.9	42'.8	236° 29'.2	25'.5
19	110° 22'.2	103° 22'.9	33'.4	99° 05'.7	10'.8	40° 41'.9	42'.9	251° 31'.8	25'.4
20	125° 24'.7	118° 22'.5	34'.6	114° 06'.4	11'.6	55° 44'.0	42'.9	266° 34'.4	25'.4
21	140° 27'.2	133° 22'.1	35'.9	129° 07'.1	12'.4	70° 46'.0	43'.0	281° 37'.0	25'.3
22	155° 29'.6	148° 21'.7	37'.2	144° 07'.8	13'.1	85° 48'.1	43'.0	296° 39'.6	25'.3
23	170° 32'.1	163° 21'.3	38'.4	159° 08'.5	13'.9	100° 50'.1	43'.1	311° 42'.2	25'.2
28 Thursday 00	185° 34'.6	178° 21'.0	1° 39'.7 N	174° 09'.2	4° 14'.7 N	115° 52'.2	21° 43'.2 N	326° 44'.8	12° 25'.2 S
01	200° 37'.0	193° 20'.6	40'.9	189° 09'.9	15'.5	130° 54'.2	43'.2	341° 47'.4	25'.1
02	215° 39'.5	208° 20'.2	42'.2	204° 10'.6	16'.2	145° 56'.3	43'.3	356° 50'.0	25'.1
03	230° 42'.0	223° 19'.8	43'.4	219° 11'.3	17'.0	160° 58'.3	43'.4	11° 52'.6	25'.0
04	245° 44'.4	238° 19'.5	44'.7	234° 12'.0	17'.8	176° 00'.3	43'.4	26° 55'.2	25'.0
05	260° 46'.9	253° 19'.1	46'.0	249° 12'.7	18'.5	191° 02'.4	43'.5	41° 57'.8	24'.9
06	275° 49'.3	268° 18'.7	47'.2	264° 13'.4	19'.3	206° 04'.4	43'.5	57° 00'.4	24'.9
07	290° 51'.8	283° 18'.3	48'.5	279° 14'.1	20'.1	221° 06'.5	43'.6	72° 03'.1	24'.8
08	305° 54'.3	298° 18'.0	49'.7	294° 14'.8	20'.8	236° 08'.5	43'.7	87° 05'.7	24'.8
09	320° 56'.7	313° 17'.6	51'.0	309° 15'.5	21'.6	251° 10'.6	43'.7	102° 08'.3	24'.7
10	335° 59'.2	328° 17'.2	52'.3	324° 16'.2	22'.4	266° 12'.6	43'.8	117° 10'.9	24'.7
11	351° 01'.7	343° 16'.8	53'.5	339° 16'.9	23'.2	281° 14'.7	43'.8	132° 13'.5	24'.6
12	6° 04'.1	358° 16'.4	1° 54'.8 N	354° 17'.6	4° 23'.9 N	296° 16'.7	21° 43'.9 N	147° 16'.1	12° 24'.6 S
13	21° 06'.6	13° 16'.1	56'.0	9° 18'.3	24'.7	311° 18'.7	44'.0	162° 18'.7	24'.5
14	36° 09'.1	28° 15'.7	57'.3	24° 19'.0	25'.5	326° 20'.8	44'.0	177° 21'.3	24'.5
15	51° 11'.5	43° 15'.3	58'.5	39° 19'.7	26'.2	341° 22'.8	44'.1	192° 23'.9	24'.4
16	66° 14'.0	58° 14'.9	59'.8	54° 20'.4	27'.0	356° 24'.9	44'.2	207° 26'.5	24'.4
17	81° 16'.5	73° 14'.6	2° 01'.1 N	69° 21'.1	27'.8	11° 26'.9	44'.2	222° 29'.1	24'.3
18	96° 18'.9	88° 14'.2	02'.3	84° 21'.8	28'.5	26° 28'.9	44'.3	237° 31'.7	24'.3
19	111° 21'.4	103° 13'.8	03'.6	99° 22'.5	29'.3	41° 31'.0	44'.3	252° 34'.3	24'.2
20	126° 23'.8	118° 13'.4	04'.8	114° 23'.2	30'.1	56° 33'.0	44'.4	267° 36'.9	24'.2
21	141° 26'.3	133° 13'.0	06'.1	129° 23'.9	30'.8	71° 35'.1	44'.5	282° 39'.5	24'.1
22	156° 28'.8	148° 12'.7	07'.3	144° 24'.6	31'.6	86° 37'.1	44'.5	297° 42'.1	24'.1
23	171° 31'.2	163° 12'.3	08'.6	159° 25'.3	32'.4	101° 39'.1	44'.6	312° 44'.7	24'.0
	M.P. 11:36	v -0'.4	d 1'.3	v 0'.7	d 0'.8	v 2'.0	d 0'.1	v 2'.6	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.4 S
Achernar	335° 27'.5	57° 10'.3 S
Acrux	173° 08'.8	63° 10'.5 S
Adhara	255° 12'.6	28° 59'.8 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.1 N
Alkaid	152° 58'.6	49° 14'.6 N
Alnair	27° 44'.3	46° 53'.6 S
Alnilam	275° 46'.6	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 10'.9	26° 40'.0 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.5	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.1 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.6 N
Atria	107° 28'.0	69° 02'.7 S
Avior	234° 17'.8	59° 33'.6 S
Bellatrix	278° 32'.2	6° 21'.5 N
Betelgeuse	271° 01'.5	7° 24'.3 N
Canopus	263° 56'.2	52° 42'.6 S
Capella	280° 34'.8	46° 00'.7 N
Deneb	49° 31'.8	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 54'.9 S
Dubhe	193° 51'.3	61° 40'.7 N
Elnath	278° 12'.9	28° 37'.0 N
Eltanin	90° 46'.1	51° 29'.0 N
Enif	33° 47'.5	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.5	57° 11'.4 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.5	60° 26'.2 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 44'.0	34° 22'.5 S
Kochab	137° 19'.1	74° 05'.9 N
Markab	13° 38'.8	15° 16'.5 N
Menkar	314° 15'.4	4° 08'.3 N
Menkent	148° 07'.4	36° 26'.1 S
Miaplacidus	221° 39'.1	69° 46'.7 S
Mirfak	308° 40'.9	49° 54'.5 N
Nunki	75° 58'.5	26° 16'.6 S
Peacock	53° 19'.8	56° 41'.2 S
Polaris	318° 12'.9	89° 19'.4 N
Pollux	243° 27'.8	27° 59'.5 N
Procyon	244° 59'.8	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.3	8° 11'.5 S
Rigil Kent	139° 51'.3	60° 53'.2 S
Sabik	102° 12'.6	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.6 N
Shaula	96° 22'.0	37° 06'.6 S
Sirius	258° 33'.8	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.3	43° 29'.6 S
Vega	80° 39'.1	38° 47'.6 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	353° 54'.6	12:06
Mars	349° 16'.9	12:24
Jupiter	290° 27'.6	16:18
Saturn	141° 07'.0	02:17

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
26 Tuesday 00	178° 33'.8	2° 10'.9 N	16° 34'.9	11'.9	0° 43'.5 N	11'.7	57'.6
01	193° 34'.0	11'.9	31° 05'.8	11'.8	31'.8	11'.6	
02	208° 34'.2	12'.9	45° 36'.6	11'.8	20'.2	11'.7	
03	223° 34'.3	13'.9	60° 07'.4	11'.8	08'.5	11'.7	57'.7
04	238° 34'.5	14'.9	74° 38'.2	11'.8	0° 03'.2 S	11'.8	
05	253° 34'.7	15'.8	89° 09'.0	11'.7	15'.0	11'.7	
06	268° 34'.9	16'.8	103° 39'.7	11'.7	26'.7	11'.8	57'.8
07	283° 35'.1	17'.8	118° 10'.4	11'.7	38'.5	11'.7	
08	298° 35'.3	18'.8	132° 41'.1	11'.6	50'.2	11'.8	
09	313° 35'.5	19'.8	147° 11'.7	11'.5	1° 02'.0 S	11'.7	
10	328° 35'.7	20'.7	161° 42'.2	11'.6	13'.7	11'.8	57'.9
11	343° 35'.9	21'.7	176° 12'.8	11'.5	25'.5	11'.8	
12	358° 36'.1	2° 22'.7 N	190° 43'.3	11'.5	1° 37'.3 S	11'.8	57'.9
13	13° 36'.2	23'.7	205° 13'.8	11'.4	49'.1	11'.8	58'.0
14	28° 36'.4	24'.7	219° 44'.2	11'.4	2° 00'.9 S	11'.7	
15	43° 36'.6	25'.6	234° 14'.6	11'.3	12'.6	11'.8	
16	58° 36'.8	26'.6	248° 44'.9	11'.3	24'.4	11'.8	
17	73° 37'.0	27'.6	263° 15'.2	11'.3	36'.2	11'.8	58'.1
18	88° 37'.2	28'.6	277° 45'.5	11'.2	48'.0	11'.8	
19	103° 37'.4	29'.6	292° 15'.7	11'.2	59'.8	11'.7	
20	118° 37'.6	30'.5	306° 45'.9	11'.1	3° 11'.5 S	11'.8	58'.2
21	133° 37'.8	31'.5	321° 16'.0	11'.1	23'.3	11'.8	
22	148° 38'.0	32'.5	335° 46'.1	11'.0	35'.1	11'.7	
23	163° 38'.1	33'.5	350° 16'.1	11'.0	46'.8	11'.8	
27 Wednesday 00	178° 38'.3	2° 34'.5 N	4° 46'.1	11'.0	3° 58'.6 S	11'.7	58'.3
01	193° 38'.5	35'.4	19° 16'.1	10'.9	4° 10'.3 S	11'.7	
02	208° 38'.7	36'.4	33° 46'.0	10'.8	22'.0	11'.7	
03	223° 38'.9	37'.4	48° 15'.8	10'.9	33'.7	11'.7	
04	238° 39'.1	38'.4	62° 45'.7	10'.7	45'.4	11'.7	58'.4
05	253° 39'.3	39'.3	77° 15'.4	10'.7	57'.1	11'.6	
06	268° 39'.5	40'.3	91° 45'.1	10'.7	5° 08'.7 S	11'.7	
07	283° 39'.7	41'.3	106° 14'.8	10'.6	20'.4	11'.6	
08	298° 39'.9	42'.3	120° 44'.4	10'.6	32'.0	11'.6	58'.5
09	313° 40'.0	43'.3	135° 14'.0	10'.5	43'.6	11'.6	
10	328° 40'.2	44'.2	149° 43'.5	10'.5	55'.2	11'.5	
11	343° 40'.4	45'.2	164° 13'.0	10'.4	6° 06'.7 S	11'.6	
12	358° 40'.6	2° 46'.2 N	178° 42'.4	10'.4	6° 18'.3 S	11'.5	58'.6
13	13° 40'.8	47'.2	193° 11'.8	10'.3	29'.8	11'.5	
14	28° 41'.0	48'.1	207° 41'.1	10'.2	41'.3	11'.4	
15	43° 41'.2	49'.1	222° 10'.3	10'.2	52'.7	11'.4	
16	58° 41'.4	50'.1	236° 39'.5	10'.2	7° 04'.1 S	11'.4	58'.7
17	73° 41'.6	51'.1	251° 08'.7	10'.1	15'.5	11'.4	
18	88° 41'.8	52'.1	265° 37'.8	10'.0	26'.9	11'.3	
19	103° 41'.9	53'.0	280° 06'.8	10'.0	38'.2	11'.3	
20	118° 42'.1	54'.0	294° 35'.8	9'.9	49'.5	11'.3	58'.8
21	133° 42'.3	55'.0	309° 04'.7	9'.9	8° 00'.8 S	11'.2	
22	148° 42'.5	56'.0	323° 33'.6	9'.8	12'.0	11'.2	
23	163° 42'.7	56'.9	338° 02'.4	9'.8	23'.2	11'.1	
28 Thursday 00	178° 42'.9	2° 57'.9 N	352° 31'.2	9'.7	8° 34'.3 S	11'.1	58'.8
01	193° 43'.1	58'.9	6° 59'.9	9'.6	45'.4	11'.1	58'.9
02	208° 43'.3	59'.9	21° 28'.5	9'.6	56'.5	11'.0	
03	223° 43'.5	3° 00'.8 N	35° 57'.1	9'.6	9° 07'.5 S	10'.9	
04	238° 43'.7	01'.8	50° 25'.7	9'.4	18'.4	11'.0	
05	253° 43'.8	02'.8	64° 54'.1	9'.5	29'.4	10'.8	59'.0
06	268° 44'.0	03'.8	79° 22'.6	9'.3	40'.2	10'.9	
07	283° 44'.2	04'.7	93° 50'.9	9'.3	51'.1	10'.7	
08	298° 44'.4	05'.7	108° 19'.2	9'.3	10° 01'.8 S	10'.8	
09	313° 44'.6	06'.7	122° 47'.5	9'.1	12'.6	10'.6	
10	328° 44'.8	07'.7	137° 15'.6	9'.2	23'.2	10'.6	
11	343° 45'.0	08'.6	151° 43'.8	9'.0	33'.8	10'.6	59'.1
12	358° 45'.2	3° 09'.6 N	166° 11'.8	9'.0	10° 44'.4 S	10'.5	59'.1
13	13° 45'.4	10'.6	180° 39'.8	9'.0	54'.9	10'.4	
14	28° 45'.6	11'.6	195° 07'.8	8'.8	11° 05'.3 S	10'.4	
15	43° 45'.7	12'.5	209° 35'.6	8'.9	15'.7	10'.4	
16	58° 45'.9	13'.5	224° 03'.5	8'.7	26'.1	10'.2	59'.2
17	73° 46'.1	14'.5	238° 31'.2	8'.7	36'.3	10'.2	
18	88° 46'.3	15'.5	252° 58'.9	8'.6	46'.5	10'.1	
19	103° 46'.5	16'.4	267° 26'.5	8'.6	56'.6	10'.1	
20	118° 46'.7	17'.4	281° 54'.1	8'.5	12° 06'.7 S	10'.0	
21	133° 46'.9	18'.4	296° 21'.6	8'.5	16'.7	9'.9	
22	148° 47'.1	19'.4	310° 49'.1	8'.4	26'.6	9'.9	59'.3
23	163° 47'.3	20'.3	325° 16'.5	8'.3	36'.5	9'.8	
	SD 16'.0	d 1'.0	SD 15'.8		16'.0	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 26	Moonrise 27	Moonrise 28
N 72°	02:27	04:10	05:22	18:06	20:04	22:12
N 70°	02:56	04:23	05:26	18:02	19:52	21:47
68°	03:17	04:33	05:30	17:58	19:42	21:29
66°	03:34	04:41	05:33	17:55	19:33	21:14
64°	03:47	04:47	05:36	17:53	19:26	21:02
62°	03:57	04:53	05:38	17:51	19:20	20:52
60°	04:06	04:58	05:40	17:49	19:15	20:44
N 58°	04:14	05:02	05:42	17:47	19:11	20:36
56°	04:21	05:06	05:44	17:46	19:07	20:29
54°	04:27	05:09	05:45	17:45	19:03	20:23
52°	04:32	05:12	05:46	17:43	19:00	20:18
50°	04:36	05:15	05:47	17:42	18:57	20:13
45°	04:46	05:21	05:50	17:40	18:51	20:03
N 40°	04:53	05:25	05:52	17:38	18:46	19:54
35°	04:59	05:28	05:54	17:36	18:41	19:47
30°	05:03	05:31	05:55	17:35	18:37	19:41
20°	05:10	05:36	05:58	17:33	18:30	19:30
N 10°	05:15	05:39	06:00	17:30	18:24	19:20
0°	05:17	05:41	06:02	17:28	18:19	19:11
S 10°	05:18	05:43	06:04	17:27	18:13	19:02
20°	05:18	05:44	06:06	17:24	18:07	18:53
30°	05:16	05:44	06:08	17:22	18:01	18:42
35°	05:14	05:44	06:09	17:21	17:57	18:36
40°	05:12	05:43	06:10	17:19	17:53	18:29
45°	05:08	05:42	06:11	17:18	17:48	18:21
S 50°	05:03	05:41	06:13	17:16	17:42	18:12
52°	05:01	05:40	06:14	17:15	17:40	18:07
54°	04:58	05:39	06:14	17:14	17:37	18:03
56°	04:55	05:38	06:15	17:13	17:33	17:57
58°	04:51	05:37	06:16	17:11	17:30	17:51
S 60°	04:47	05:36	06:17	17:10	17:26	17:45
S 62°	04:42	05:34	06:18	17:09	17:21	17:37

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 26	Moonset 27	Moonset 28
N 72°	18:52	20:04	21:50	04:59	04:47	04:35
N 70°	18:47	19:51	21:19	04:59	04:54	04:49
68°	18:43	19:41	20:57	05:00	05:00	05:01
66°	18:39	19:32	20:40	05:00	05:05	05:11
64°	18:37	19:25	20:27	05:00	05:09	05:19
62°	18:34	19:19	20:16	05:00	05:12	05:26
60°	18:32	19:14	20:06	05:01	05:15	05:32
N 58°	18:30	19:10	19:58	05:01	05:18	05:38
56°	18:28	19:06	19:51	05:01	05:21	05:43
54°	18:27	19:03	19:46	05:01	05:23	05:47
52°	18:25	18:59	19:40	05:01	05:25	05:51
50°	18:24	18:57	19:36	05:01	05:27	05:55
45°	18:21	18:51	19:26	05:02	05:31	06:02
N 40°	18:19	18:46	19:18	05:02	05:34	06:09
35°	18:17	18:43	19:13	05:02	05:37	06:15
30°	18:16	18:40	19:08	05:02	05:40	06:20
20°	18:13	18:35	19:01	05:03	05:44	06:29
N 10°	18:11	18:32	18:56	05:03	05:48	06:36
0°	18:09	18:29	18:53	05:03	05:52	06:43
S 10°	18:07	18:28	18:52	05:03	05:56	06:51
20°	18:05	18:27	18:52	05:03	06:00	06:58
30°	18:02	18:26	18:54	05:04	06:04	07:07
35°	18:01	18:26	18:56	05:04	06:07	07:12
40°	18:00	18:27	18:58	05:04	06:10	07:18
45°	17:58	18:28	19:02	05:04	06:13	07:25
S 50°	17:57	18:29	19:06	05:04	06:18	07:33
52°	17:56	18:29	19:09	05:04	06:20	07:37
54°	17:55	18:30	19:11	05:04	06:22	07:41
56°	17:54	18:31	19:14	05:04	06:24	07:46
58°	17:53	18:32	19:18	05:04	06:26	07:51
S 60°	17:52	18:33	19:22	05:04	06:29	07:57
S 62°	17:51	18:35	19:27	05:04	06:33	08:03

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
26	5 45	5 36	12:06	23:40	11:16	15d 99%
27	5 27	5 18	12:05	24:31	12:05	16d Full
28	5 09	5 00	12:05	00:31	12:57	17d 98%

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2013 March 29, 30, 31 (Fri, Sat, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.1		SATURN +0.3	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
29 Friday 00	186° 33'.7	178° 11'.9	2° 09'.9 N	174° 26'.0	4° 33'.1 N	116° 41'.2	21° 44'.6 N	327° 47'.3	12° 24'.0 S
01	201° 36'.2	193° 11'.5	11'.1	189° 26'.7	33'.9	131° 43'.2	44'.7	342° 49'.9	23'.9
02	216° 38'.6	208° 11'.2	12'.4	204° 27'.4	34'.7	146° 45'.3	44'.8	357° 52'.5	23'.9
03	231° 41'.1	223° 10'.8	13'.6	219° 28'.1	35'.5	161° 47'.3	44'.8	12° 55'.1	23'.8
04	246° 43'.6	238° 10'.4	14'.9	234° 28'.8	36'.2	176° 49'.3	44'.9	27° 57'.7	23'.8
05	261° 46'.0	253° 10'.0	16'.1	249° 29'.5	37'.0	191° 51'.4	44'.9	43° 00'.3	23'.7
06	276° 48'.5	268° 09'.7	17'.4	264° 30'.2	37'.8	206° 53'.4	45'.0	58° 02'.9	23'.7
07	291° 51'.0	283° 09'.3	18'.7	279° 30'.9	38'.5	221° 55'.5	45'.1	73° 05'.5	23'.6
08	306° 53'.4	298° 08'.9	19'.9	294° 31'.6	39'.3	236° 57'.5	45'.1	88° 08'.1	23'.6
09	321° 55'.9	313° 08'.5	21'.2	309° 32'.3	40'.1	251° 59'.5	45'.2	103° 10'.7	23'.5
10	336° 58'.3	328° 08'.1	22'.4	324° 33'.0	40'.8	267° 01'.6	45'.3	118° 13'.3	23'.5
11	352° 00'.8	343° 07'.8	23'.7	339° 33'.7	41'.6	282° 03'.6	45'.3	133° 15'.9	23'.4
12	7° 03'.3	358° 07'.4	2° 24'.9 N	354° 34'.4	4° 42'.4 N	297° 05'.7	21° 45'.4 N	148° 18'.5	12° 23'.4 S
13	22° 05'.7	13° 07'.0	26'.2	9° 35'.1	43'.1	312° 07'.7	45'.4	163° 21'.2	23'.3
14	37° 08'.2	28° 06'.6	27'.4	24° 35'.8	43'.9	327° 09'.7	45'.5	178° 23'.8	23'.3
15	52° 10'.7	43° 06'.2	28'.7	39° 36'.5	44'.7	342° 11'.8	45'.6	193° 26'.4	23'.2
16	67° 13'.1	58° 05'.9	30'.0	54° 37'.2	45'.4	357° 13'.8	45'.6	208° 29'.0	23'.2
17	82° 15'.6	73° 05'.5	31'.2	69° 37'.9	46'.2	12° 15'.8	45'.7	223° 31'.6	23'.1
18	97° 18'.1	88° 05'.1	32'.5	84° 38'.6	47'.0	27° 17'.9	45'.7	238° 34'.2	23'.1
19	112° 20'.5	103° 04'.7	33'.7	99° 39'.3	47'.7	42° 19'.9	45'.8	253° 36'.8	23'.0
20	127° 23'.0	118° 04'.4	35'.0	114° 40'.0	48'.5	57° 21'.9	45'.9	268° 39'.4	23'.0
21	142° 25'.4	133° 04'.0	36'.2	129° 40'.7	49'.3	72° 24'.0	45'.9	283° 42'.0	22'.9
22	157° 27'.9	148° 03'.6	37'.5	144° 41'.4	50'.0	87° 26'.0	46'.0	298° 44'.6	22'.9
23	172° 30'.4	163° 03'.2	38'.7	159° 42'.1	50'.8	102° 28'.0	46'.1	313° 47'.2	22'.8
30 Saturday 00	187° 32'.8	178° 02'.8	2° 40'.0 N	174° 42'.8	4° 51'.6 N	117° 30'.1	21° 46'.1 N	328° 49'.8	12° 22'.8 S
01	202° 35'.3	193° 02'.5	41'.3	189° 43'.5	52'.3	132° 32'.1	46'.2	343° 52'.4	22'.7
02	217° 37'.8	208° 02'.1	42'.5	204° 44'.2	53'.1	147° 34'.2	46'.2	358° 55'.0	22'.6
03	232° 40'.2	223° 01'.7	43'.8	219° 44'.9	53'.8	162° 36'.2	46'.3	13° 57'.6	22'.6
04	247° 42'.7	238° 01'.3	45'.0	234° 45'.6	54'.6	177° 38'.2	46'.4	29° 00'.2	22'.5
05	262° 45'.2	253° 00'.9	46'.3	249° 46'.3	55'.4	192° 40'.3	46'.4	44° 02'.8	22'.5
06	277° 47'.6	268° 00'.6	47'.5	264° 47'.0	56'.1	207° 42'.3	46'.5	59° 05'.5	22'.4
07	292° 50'.1	283° 00'.2	48'.8	279° 47'.7	56'.9	222° 44'.3	46'.5	74° 08'.1	22'.4
08	307° 52'.6	297° 59'.8	50'.0	294° 48'.4	57'.7	237° 46'.4	46'.6	89° 10'.7	22'.3
09	322° 55'.0	312° 59'.4	51'.3	309° 49'.1	58'.4	252° 48'.4	46'.7	104° 13'.3	22'.3
10	337° 57'.5	327° 59'.1	52'.5	324° 49'.8	59'.2	267° 50'.4	46'.7	119° 15'.9	22'.2
11	352° 59'.9	342° 58'.7	53'.8	339° 50'.5	5° 00'.0 N	282° 52'.5	46'.8	134° 18'.5	22'.2
12	8° 02'.4	357° 58'.3	2° 55'.1 N	354° 51'.2	5° 00'.7 N	297° 54'.5	21° 46'.9 N	149° 21'.1	12° 22'.1 S
13	23° 04'.9	12° 57'.9	56'.3	9° 52'.0	01'.5	312° 56'.5	46'.9	164° 23'.7	22'.1
14	38° 07'.3	27° 57'.5	57'.6	24° 52'.7	02'.3	327° 58'.5	47'.0	179° 26'.3	22'.0
15	53° 09'.8	42° 57'.2	58'.8	39° 53'.4	03'.0	343° 00'.6	47'.0	194° 28'.9	22'.0
16	68° 12'.3	57° 56'.8	3° 00'.1 N	54° 54'.1	03'.8	358° 02'.6	47'.1	209° 31'.5	21'.9
17	83° 14'.7	72° 56'.4	01'.3	69° 54'.8	04'.5	13° 04'.6	47'.2	224° 34'.1	21'.9
18	98° 17'.2	87° 56'.0	02'.6	84° 55'.5	05'.3	28° 06'.7	47'.2	239° 36'.7	21'.8
19	113° 19'.7	102° 55'.6	03'.8	99° 56'.2	06'.1	43° 08'.7	47'.3	254° 39'.4	21'.8
20	128° 22'.1	117° 55'.3	05'.1	114° 56'.9	06'.8	58° 10'.7	47'.3	269° 42'.0	21'.7
21	143° 24'.6	132° 54'.9	06'.3	129° 57'.6	07'.6	73° 12'.8	47'.4	284° 44'.6	21'.7
22	158° 27'.1	147° 54'.5	07'.6	144° 58'.3	08'.4	88° 14'.8	47'.5	299° 47'.2	21'.6
23	173° 29'.5	162° 54'.1	08'.8	159° 59'.0	09'.1	103° 16'.8	47'.5	314° 49'.8	21'.6
31 Sunday 00	188° 32'.0	177° 53'.7	3° 10'.1 N	174° 59'.7	5° 09'.9 N	118° 18'.9	21° 47'.6 N	329° 52'.4	12° 21'.5 S
01	203° 34'.4	192° 53'.4	11'.3	190° 00'.4	10'.7	133° 20'.9	47'.7	344° 55'.0	21'.5
02	218° 36'.9	207° 53'.0	12'.6	205° 01'.1	11'.4	148° 22'.9	47'.7	359° 57'.6	21'.4
03	233° 39'.4	222° 52'.6	13'.9	220° 01'.8	12'.2	163° 24'.9	47'.8	15° 00'.2	21'.4
04	248° 41'.8	237° 52'.2	15'.1	235° 02'.5	12'.9	178° 27'.0	47'.8	30° 02'.8	21'.3
05	263° 44'.3	252° 51'.8	16'.4	250° 03'.2	13'.7	193° 29'.0	47'.9	45° 05'.4	21'.3
06	278° 46'.8	267° 51'.4	17'.6	265° 03'.9	14'.5	208° 31'.0	48'.0	60° 08'.1	21'.2
07	293° 49'.2	282° 51'.1	18'.9	280° 04'.6	15'.2	223° 33'.1	48'.0	75° 10'.7	21'.1
08	308° 51'.7	297° 50'.7	20'.1	295° 05'.3	16'.0	238° 35'.1	48'.1	90° 13'.3	21'.1
09	323° 54'.2	312° 50'.3	21'.4	310° 06'.0	16'.8	253° 37'.1	48'.2	105° 15'.9	21'.0
10	338° 56'.6	327° 49'.9	22'.6	325° 06'.7	17'.5	268° 39'.1	48'.2	120° 18'.5	21'.0
11	353° 59'.1	342° 49'.5	23'.9	340° 07'.4	18'.3	283° 41'.2	48'.3	135° 21'.1	20'.9
12	9° 01'.5	357° 49'.2	3° 25'.1 N	355° 08'.1	5° 19'.0 N	298° 43'.2	21° 48'.3 N	150° 23'.7	12° 20'.9 S
13	24° 04'.0	12° 48'.8	26'.4	10° 08'.8	19'.8	313° 45'.2	48'.4	165° 26'.3	20'.8
14	39° 06'.5	27° 48'.4	27'.6	25° 09'.5	20'.6	328° 47'.3	48'.5	180° 28'.9	20'.8
15	54° 08'.9	42° 48'.0	28'.9	40° 10'.2	21'.3	343° 49'.3	48'.5	195° 31'.5	20'.7
16	69° 11'.4	57° 47'.6	30'.1	55° 10'.9	22'.1	358° 51'.3	48'.6	210° 34'.2	20'.7
17	84° 13'.9	72° 47'.3	31'.4	70° 11'.6	22'.8	13° 53'.3	48'.6	225° 36'.8	20'.6
18	99° 16'.3	87° 46'.9	32'.6	85° 12'.3	23'.6	28° 55'.4	48'.7	240° 39'.4	20'.6
19	114° 18'.8	102° 46'.5	33'.9	100° 13'.0	24'.4	43° 57'.4	48'.8	255° 42'.0	20'.5
20	129° 21'.3	117° 46'.1	35'.1	115° 13'.7	25'.1	58° 59'.4	48'.8	270° 44'.6	20'.5
21	144° 23'.7	132° 45'.7	36'.4	130° 14'.4	25'.9	74° 01'.4	48'.9	285° 47'.2	20'.4
22	159° 26'.2	147° 45'.3	37'.6	145° 15'.1	26'.6	89° 03'.5	49'.0	300° 49'.8	20'.4
23	174° 28'.7	162° 45'.0	38'.9	160° 15'.8	27'.4	104° 05'.5	49'.0	315° 52'.4	20'.3
	M.P. 11:24	v -0'.4	d 1'.3	v 0'.7	d 0'.8	v 2'.0	d 0'.1	v 2'.6	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.8	40° 15'.4 S
Achernar	335° 27'.5	57° 10'.3 S
Acrux	173° 08'.7	63° 10'.5 S
Adhara	255° 12'.6	28° 59'.8 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.1 N
Alkaid	152° 58'.6	49° 14'.7 N
Alnair	27° 44'.3	46° 53'.6 S
Alnilam	275° 46'.6	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 10'.9	26° 40'.1 N
Alpheratz	357° 44'.0	29° 09'.8 N
Altair	62° 08'.5	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.1 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.6 N
Atria	107° 28'.0	69° 02'.7 S
Avior	234° 17'.8	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.5	7° 24'.3 N
Canopus	263° 56'.2	52° 42'.6 S
Capella	280° 34'.8	46° 00'.7 N
Deneb	49° 31'.8	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 54'.9 S
Dubhe	193° 51'.3	61° 40'.7 N
Elnath	278° 12'.9	28° 37'.0 N
Eltanin	90° 46'.1	51° 29'.0 N
Enif	33° 47'.5	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.1 S
Gacrux	172° 00'.4	57° 11'.4 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.5	60° 26'.2 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 44'.0	34° 22'.5 S
Kochab	137° 19'.1	74° 05'.9 N
Markab	13° 38'.8	15° 16'.5 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.4	36° 26'.1 S
Miaplacidus	221° 39'.1	69° 46'.7 S
Mirfak	308° 40'.9	49° 54'.5 N
Nunki	75° 58'.5	26° 16'.6 S
Peacock	53° 19'.7	56° 41'.2 S
Polaris	318° 13'.5	89° 19'.4 N
Pollux	243° 27'.8	27° 59'.5 N
Procyon	244° 59'.8	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.3	8° 11'.5 S
Rigil Kent	139° 51'.3	60° 53'.3 S
Sabik	102° 12'.6	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.6 N
Shaula	96° 22'.0	37° 06'.6 S
Sirius	258° 33'.8	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.3	43° 29'.6 S
Vega	80° 39'.0	38° 47'.6 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	350° 30'.0	12:08
Mars	347° 10'.0	12:21
Jupiter	289° 57'.2	16:08
Saturn	141° 17'.0	02:04

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 47'.4	3° 21'.3 N	339° 43'.8	8'.3	12° 46'.3 S	9'.7	59'.3
193° 47'.6	22'.3	354° 11'.1	8'.2	56'.0	9'.6	
208° 47'.8	23'.3	8° 38'.3	8'.1	13° 05'.6 S	9'.6	
223° 48'.0	24'.2	23° 05'.4	8'.1	15'.2	9'.4	
238° 48'.2	25'.2	37° 32'.5	8'.0	24'.6	9'.4	
253° 48'.4	26'.2	51° 59'.5	8'.0	34'.0	9'.4	59'.4
268° 48'.6	27'.2	66° 26'.5	7'.9	43'.4	9'.2	
283° 48'.8	28'.1	80° 53'.4	7'.8	52'.6	9'.2	
298° 49'.0	29'.1	95° 20'.2	7'.8	14° 01'.8 S	9'.0	
313° 49'.1	30'.1	109° 47'.0	7'.7	10'.8	9'.0	
328° 49'.3	31'.0	124° 13'.7	7'.7	19'.8	8'.9	
343° 49'.5	32'.0	138° 40'.4	7'.6	28'.7	8'.8	
358° 49'.7	3° 33'.0 N	153° 07'.0	7'.5	14° 37'.5 S	8'.8	59'.4
13° 49'.9	34'.0	167° 33'.5	7'.5	46'.3	8'.6	59'.5
28° 50'.1	34'.9	182° 00'.0	7'.4	54'.9	8'.6	
43° 50'.3	35'.9	196° 26'.4	7'.4	15° 03'.5 S	8'.4	
58° 50'.5	36'.9	210° 52'.8	7'.3	11'.9	8'.4	
73° 50'.7	37'.8	225° 19'.1	7'.3	20'.3	8'.2	
88° 50'.9	38'.8	239° 45'.4	7'.2	28'.5	8'.2	
103° 51'.0	39'.8	254° 11'.6	7'.1	36'.7	8'.1	
118° 51'.2	40'.8	268° 37'.7	7'.1	44'.8	7'.9	
133° 51'.4	41'.7	283° 03'.8	7'.0	52'.7	7'.9	
148° 51'.6	42'.7	297° 29'.8	7'.0	16° 00'.6 S	7'.8	
163° 51'.8	43'.7	311° 55'.8	6'.9	08'.4	7'.6	59'.6
178° 52'.0	3° 44'.6 N	326° 21'.7	6'.8	16° 16'.0 S	7'.6	59'.6
193° 52'.2	45'.6	340° 47'.5	6'.8	23'.6	7'.5	
208° 52'.4	46'.6	355° 13'.3	6'.8	31'.1	7'.3	
223° 52'.5	47'.6	9° 39'.1	6'.7	38'.4	7'.3	
238° 52'.7	48'.5	24° 04'.8	6'.6	45'.7	7'.1	
253° 52'.9	49'.5	38° 30'.4	6'.6	52'.8	7'.0	
268° 53'.1	50'.5	52° 56'.0	6'.6	59'.8	6'.9	
283° 53'.3	51'.4	67° 21'.6	6'.5	17° 06'.7 S	6'.9	
298° 53'.5	52'.4	81° 47'.1	6'.4	13'.6	6'.6	
313° 53'.7	53'.4	96° 12'.5	6'.4	20'.2	6'.6	
328° 53'.9	54'.4	110° 37'.9	6'.3	26'.8	6'.5	
343° 54'.1	55'.3	125° 03'.2	6'.4	33'.3	6'.4	
358° 54'.2	3° 56'.3 N	139° 28'.6	6'.2	17° 39'.7 S	6'.2	59'.6
13° 54'.4	57'.3	153° 53'.8	6'.2	45'.9	6'.1	
28° 54'.6	58'.2	168° 19'.0	6'.2	52'.0	6'.0	
43° 54'.8	59'.2	182° 44'.2	6'.1	58'.0	5'.9	
58° 55'.0	4° 00'.2 N	197° 09'.3	6'.1	18° 03'.9 S	5'.8	
73° 55'.2	01'.1	211° 34'.4	6'.0	09'.7	5'.6	59'.7
88° 55'.4	02'.1	225° 59'.4	6'.0	15'.3	5'.5	
103° 55'.6	03'.1	240° 24'.4	6'.0	20'.8	5'.4	
118° 55'.7	04'.0	254° 49'.4	5'.9	26'.2	5'.3	
133° 55'.9	05'.0	269° 14'.3	5'.9	31'.5	5'.2	
148° 56'.1	06'.0	283° 39'.2	5'.8	36'.7	5'.0	
163° 56'.3	06'.9	298° 04'.0	5'.8	41'.7	4'.9	
178° 56'.5	4° 07'.9 N	312° 28'.8	5'.8	18° 46'.6 S	4'.8	59'.7
193° 56'.7	08'.9	326° 53'.6	5'.7	51'.4	4'.6	
208° 56'.9	09'.9	341° 18'.3	5'.7	56'.0	4'.5	
223° 57'.1	10'.8	355° 43'.0	5'.7	19° 00'.5 S	4'.4	
238° 57'.3	11'.8	10° 07'.7	5'.7	04'.9	4'.3	
253° 57'.4	12'.8	24° 32'.4	5'.6	09'.2	4'.1	
268° 57'.6	13'.7	38° 57'.0	5'.6	13'.3	4'.0	
283° 57'.8	14'.7	53° 21'.6	5'.5	17'.3	3'.9	
298° 58'.0	15'.7	67° 46'.1	5'.6	21'.2	3'.8	
313° 58'.2	16'.6	82° 10'.7	5'.5	25'.0	3'.6	
328° 58'.4	17'.6	96° 35'.2	5'.5	28'.6	3'.4	
343° 58'.6	18'.6	110° 59'.7	5'.4	32'.0	3'.4	
358° 58'.7	4° 19'.5 N	125° 24'.1	5'.5	19° 35'.4 S	3'.2	59'.7
13° 58'.9	20'.5	139° 48'.6	5'.4	38'.6	3'.1	
28° 59'.1	21'.5	154° 13'.0	5'.4	41'.7	2'.9	
43° 59'.3	22'.4	168° 37'.4	5'.4	44'.6	2'.8	
58° 59'.5	23'.4	183° 01'.8	5'.4	47'.4	2'.7	59'.6
73° 59'.7	24'.4	197° 26'.2	5'.4	50'.1	2'.6	
88° 59'.9	25'.3	211° 50'.6	5'.3	52'.7	2'.4	
104° 00'.1	26'.3	226° 14'.9	5'.4	55'.1	2'.2	
119° 00'.2	27'.3	240° 39'.3	5'.3	57'.3	2'.2	
134° 00'.4	28'.2	255° 03'.6	5'.3	59'.5	2'.0	
149° 00'.6	29'.2	269° 27'.9	5'.3	20° 01'.5 S	1'.8	
164° 00'.8	30'.1	283° 52'.2	5'.3	03'.3	1'.7	
SD 16'.0	d 1'.0	SD 16'.2		16'.2	16'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 29	Moonrise 30	Moonrise 31
N 72°	01:59	03:53	05:06	-	00:39	-
N 70°	02:35	04:07	05:12	23:50	-	02:03
68°	03:00	04:19	05:17	23:19	-	01:07
66°	03:19	04:28	05:22	22:56	-	00:34
64°	03:34	04:36	05:25	22:38	-	00:09
62°	03:46	04:43	05:28	22:24	23:50	25:06
60°	03:56	04:49	05:31	22:11	23:35	24:48
N 58°	04:05	04:54	05:33	22:01	23:21	24:33
56°	04:12	04:58	05:36	21:52	23:10	24:21
54°	04:18	05:02	05:38	21:43	23:00	24:09
52°	04:24	05:05	05:39	21:36	22:51	24:00
50°	04:29	05:08	05:41	21:30	22:43	23:51
45°	04:40	05:15	05:44	21:16	22:26	23:33
N 40°	04:48	05:20	05:47	21:04	22:12	23:18
35°	04:54	05:24	05:50	20:54	22:01	23:05
30°	05:00	05:28	05:52	20:46	21:51	22:54
20°	05:07	05:33	05:55	20:31	21:33	22:35
N 10°	05:13	05:37	05:58	20:18	21:18	22:18
0°	05:16	05:40	06:01	20:06	21:04	22:03
S 10°	05:18	05:43	06:04	19:55	20:50	21:48
20°	05:19	05:44	06:07	19:42	20:35	21:31
30°	05:18	05:46	06:09	19:28	20:18	21:13
35°	05:17	05:46	06:11	19:19	20:08	21:02
40°	05:15	05:46	06:13	19:10	19:57	20:49
45°	05:12	05:46	06:15	18:59	19:43	20:34
S 50°	05:08	05:45	06:18	18:46	19:27	20:17
52°	05:06	05:45	06:19	18:40	19:20	20:08
54°	05:04	05:45	06:20	18:33	19:11	19:59
56°	05:01	05:44	06:21	18:26	19:02	19:48
58°	04:58	05:44	06:23	18:17	18:51	19:36
S 60°	04:54	05:43	06:25	18:08	18:39	19:22
S 62°	04:50	05:42	06:26	17:57	18:25	19:05

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 29	Moonset 30	Moonset 31
N 72°	19:06	20:20	22:19	04:18	03:47	-
N 70°	18:59	20:05	21:39	04:44	04:37	04:25
68°	18:54	19:53	21:13	05:03	05:09	05:22
66°	18:49	19:43	20:53	05:19	05:32	05:55
64°	18:45	19:35	20:38	05:32	05:51	06:20
62°	18:42	19:28	20:26	05:43	06:06	06:39
60°	18:39	19:22	20:15	05:53	06:19	06:56
N 58°	18:37	19:17	20:06	06:01	06:30	07:09
56°	18:34	19:12	19:59	06:08	06:40	07:21
54°	18:32	19:08	19:52	06:15	06:49	07:31
52°	18:31	19:05	19:46	06:21	06:56	07:40
50°	18:29	19:02	19:41	06:26	07:03	07:48
45°	18:25	18:55	19:30	06:38	07:18	08:06
N 40°	18:22	18:50	19:22	06:47	07:31	08:20
35°	18:20	18:45	19:15	06:56	07:41	08:32
30°	18:18	18:42	19:10	07:03	07:51	08:43
20°	18:14	18:36	19:02	07:16	08:06	09:01
N 10°	18:11	18:32	18:56	07:27	08:20	09:17
0°	18:08	18:28	18:52	07:37	08:33	09:32
S 10°	18:05	18:26	18:50	07:48	08:47	09:47
20°	18:02	18:24	18:50	07:59	09:01	10:03
30°	17:59	18:23	18:50	08:12	09:17	10:21
35°	17:57	18:22	18:52	08:19	09:26	10:32
40°	17:55	18:22	18:53	08:27	09:37	10:44
45°	17:53	18:22	18:56	08:37	09:49	10:58
S 50°	17:50	18:22	19:00	08:49	10:05	11:16
52°	17:49	18:23	19:02	08:55	10:12	11:24
54°	17:48	18:23	19:04	09:01	10:20	11:33
56°	17:46	18:23	19:06	09:08	10:29	11:44
58°	17:45	18:24	19:09	09:16	10:39	11:56
S 60°	17:43	18:24	19:13	09:25	10:51	12:09
S 62°	17:41	18:25	19:17	09:35	11:04	12:26

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
29	4 51	4 42	12:05	01:24	13:52	18d 94%
30	4 32	4 23	12:04	02:20	14:49	19d 88%
31	4 14	4 05	12:04	03:18	15:47	20d 79%

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2013 April 1, 2, 3 (Mon, Tue, Wed)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.1		SATURN +0.3	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
1 Monday 00	189° 31'.1	177° 44'.6	3° 40'.1 N	175° 16'.5	5° 28'.2 N	119° 07'.5	21° 49'.1 N	330° 55'.0	12° 20'.3 S
01	204° 33'.6	192° 44'.2	41'.4	190° 17'.2	28'.9	134° 09'.5	49'.1	345° 57'.7	20'.2
02	219° 36'.0	207° 43'.8	42'.6	205° 17'.9	29'.7	149° 11'.6	49'.2	1° 00'.3	20'.1
03	234° 38'.5	222° 43'.4	43'.9	220° 18'.6	30'.4	164° 13'.6	49'.3	16° 02'.9	20'.1
04	249° 41'.0	237° 43'.0	45'.1	235° 19'.3	31'.2	179° 15'.6	49'.3	31° 05'.5	20'.0
05	264° 43'.4	252° 42'.7	46'.4	250° 20'.0	32'.0	194° 17'.6	49'.4	46° 08'.1	20'.0
06	279° 45'.9	267° 42'.3	47'.6	265° 20'.7	32'.7	209° 19'.7	49'.4	61° 10'.7	19'.9
07	294° 48'.4	282° 41'.9	48'.9	280° 21'.4	33'.5	224° 21'.7	49'.5	76° 13'.3	19'.9
08	309° 50'.8	297° 41'.5	50'.1	295° 22'.1	34'.2	239° 23'.7	49'.6	91° 15'.9	19'.8
09	324° 53'.3	312° 41'.1	51'.4	310° 22'.8	35'.0	254° 25'.7	49'.6	106° 18'.6	19'.8
10	339° 55'.8	327° 40'.8	52'.6	325° 23'.5	35'.8	269° 27'.7	49'.7	121° 21'.2	19'.7
11	354° 58'.2	342° 40'.4	53'.9	340° 24'.2	36'.5	284° 29'.8	49'.8	136° 23'.8	19'.7
12	10° 00'.7	357° 40'.0	3° 55'.1 N	355° 24'.9	5° 37'.3 N	299° 31'.8	21° 49'.8 N	151° 26'.4	12° 19'.6 S
13	25° 03'.2	12° 39'.6	56'.4	10° 25'.6	38'.0	314° 33'.8	49'.9	166° 29'.0	19'.6
14	40° 05'.6	27° 39'.2	57'.6	25° 26'.3	38'.8	329° 35'.8	49'.9	181° 31'.6	19'.5
15	55° 08'.1	42° 38'.8	58'.9	40° 27'.0	39'.6	344° 37'.9	50'.0	196° 34'.2	19'.5
16	70° 10'.5	57° 38'.4	4° 00'.1 N	55° 27'.7	40'.3	359° 39'.9	50'.1	211° 36'.8	19'.4
17	85° 13'.0	72° 38'.1	01'.4	70° 28'.4	41'.1	14° 41'.9	50'.1	226° 39'.5	19'.4
18	100° 15'.5	87° 37'.7	02'.6	85° 29'.1	41'.8	29° 43'.9	50'.2	241° 42'.1	19'.3
19	115° 17'.9	102° 37'.3	03'.9	100° 29'.8	42'.6	44° 45'.9	50'.3	256° 44'.7	19'.2
20	130° 20'.4	117° 36'.9	05'.1	115° 30'.5	43'.3	59° 48'.0	50'.3	271° 47'.3	19'.2
21	145° 22'.9	132° 36'.5	06'.4	130° 31'.2	44'.1	74° 50'.0	50'.4	286° 49'.9	19'.1
22	160° 25'.3	147° 36'.1	07'.6	145° 31'.9	44'.9	89° 52'.0	50'.4	301° 52'.5	19'.1
23	175° 27'.8	162° 35'.8	08'.8	160° 32'.6	45'.6	104° 54'.0	50'.5	316° 55'.1	19'.0
2 Tuesday 00	190° 30'.3	177° 35'.4	4° 10'.1 N	175° 33'.3	5° 46'.4 N	119° 56'.0	21° 50'.6 N	331° 57'.8	12° 19'.0 S
01	205° 32'.7	192° 35'.0	11'.3	190° 34'.0	47'.1	134° 58'.1	50'.6	347° 00'.4	18'.9
02	220° 35'.2	207° 34'.6	12'.6	205° 34'.7	47'.9	150° 00'.1	50'.7	2° 03'.0	18'.9
03	235° 37'.7	222° 34'.2	13'.8	220° 35'.4	48'.6	165° 02'.1	50'.7	17° 05'.6	18'.8
04	250° 40'.1	237° 33'.8	15'.1	235° 36'.1	49'.4	180° 04'.1	50'.8	32° 08'.2	18'.8
05	265° 42'.6	252° 33'.4	16'.3	250° 36'.8	50'.2	195° 06'.1	50'.9	47° 10'.8	18'.7
06	280° 45'.0	267° 33'.1	17'.6	265° 37'.5	50'.9	210° 08'.2	50'.9	62° 13'.4	18'.7
07	295° 47'.5	282° 32'.7	18'.8	280° 38'.2	51'.7	225° 10'.2	51'.0	77° 16'.1	18'.6
08	310° 50'.0	297° 32'.3	20'.1	295° 38'.9	52'.4	240° 12'.2	51'.1	92° 18'.7	18'.6
09	325° 52'.4	312° 31'.9	21'.3	310° 39'.6	53'.2	255° 14'.2	51'.1	107° 21'.3	18'.5
10	340° 54'.9	327° 31'.5	22'.6	325° 40'.3	53'.9	270° 16'.2	51'.2	122° 23'.9	18'.4
11	355° 57'.4	342° 31'.1	23'.8	340° 41'.0	54'.7	285° 18'.2	51'.2	137° 26'.5	18'.4
12	10° 59'.8	357° 30'.7	4° 25'.0 N	355° 41'.7	5° 55'.4 N	300° 20'.3	21° 51'.3 N	152° 29'.1	12° 18'.3 S
13	26° 02'.3	12° 30'.4	26'.3	10° 42'.4	56'.2	315° 22'.3	51'.4	167° 31'.7	18'.3
14	41° 04'.8	27° 30'.0	27'.5	25° 43'.1	57'.0	330° 24'.3	51'.4	182° 34'.4	18'.2
15	56° 07'.2	42° 29'.6	28'.8	40° 43'.8	57'.7	345° 26'.3	51'.5	197° 37'.0	18'.2
16	71° 09'.7	57° 29'.2	30'.0	55° 44'.5	58'.5	0° 28'.3	51'.5	212° 39'.6	18'.1
17	86° 12'.1	72° 28'.8	31'.3	70° 45'.2	59'.2	15° 30'.3	51'.6	227° 42'.2	18'.1
18	101° 14'.6	87° 28'.4	32'.5	85° 45'.9	6° 00'.0 N	30° 32'.4	51'.7	242° 44'.8	18'.0
19	116° 17'.1	102° 28'.0	33'.8	100° 46'.6	00'.7	45° 34'.4	51'.7	257° 47'.4	18'.0
20	131° 19'.5	117° 27'.6	35'.0	115° 47'.3	01'.5	60° 36'.4	51'.8	272° 50'.1	17'.9
21	146° 22'.0	132° 27'.3	36'.2	130° 48'.0	02'.2	75° 38'.4	51'.9	287° 52'.7	17'.9
22	161° 24'.5	147° 26'.9	37'.5	145° 48'.7	03'.0	90° 40'.4	51'.9	302° 55'.3	17'.8
23	176° 26'.9	162° 26'.5	38'.7	160° 49'.4	03'.8	105° 42'.4	52'.0	317° 57'.9	17'.7
3 Wednesday 00	191° 29'.4	177° 26'.1	4° 40'.0 N	175° 50'.1	6° 04'.5 N	120° 44'.4	21° 52'.0 N	333° 00'.5	12° 17'.7 S
01	206° 31'.9	192° 25'.7	41'.2	190° 50'.8	05'.3	135° 46'.5	52'.1	348° 03'.1	17'.6
02	221° 34'.3	207° 25'.3	42'.5	205° 51'.5	06'.0	150° 48'.5	52'.2	3° 05'.8	17'.6
03	236° 36'.8	222° 24'.9	43'.7	220° 52'.2	06'.8	165° 50'.5	52'.2	18° 08'.4	17'.5
04	251° 39'.3	237° 24'.5	44'.9	235° 52'.9	07'.5	180° 52'.5	52'.3	33° 11'.0	17'.5
05	266° 41'.7	252° 24'.2	46'.2	250° 53'.6	08'.3	195° 54'.5	52'.4	48° 13'.6	17'.4
06	281° 44'.2	267° 23'.8	47'.4	265° 54'.3	09'.0	210° 56'.5	52'.4	63° 16'.2	17'.4
07	296° 46'.6	282° 23'.4	48'.7	280° 55'.0	09'.8	225° 58'.5	52'.5	78° 18'.8	17'.3
08	311° 49'.1	297° 23'.0	49'.9	295° 55'.7	10'.5	241° 00'.6	52'.5	93° 21'.5	17'.3
09	326° 51'.6	312° 22'.6	51'.2	310° 56'.4	11'.3	256° 02'.6	52'.6	108° 24'.1	17'.2
10	341° 54'.0	327° 22'.2	52'.4	325° 57'.1	12'.0	271° 04'.6	52'.7	123° 26'.7	17'.2
11	356° 56'.5	342° 21'.8	53'.6	340° 57'.8	12'.8	286° 06'.6	52'.7	138° 29'.3	17'.1
12	11° 59'.0	357° 21'.4	4° 54'.9 N	355° 58'.5	6° 13'.5 N	301° 08'.6	21° 52'.8 N	153° 31'.9	12° 17'.0 S
13	27° 01'.4	12° 21'.0	56'.1	10° 59'.2	14'.3	316° 10'.6	52'.8	168° 34'.5	17'.0
14	42° 03'.9	27° 20'.7	57'.4	25° 59'.9	15'.1	331° 12'.6	52'.9	183° 37'.2	16'.9
15	57° 06'.4	42° 20'.3	58'.6	41° 00'.6	15'.8	346° 14'.6	53'.0	198° 39'.8	16'.9
16	72° 08'.8	57° 19'.9	59'.8	56° 01'.3	16'.6	1° 16'.7	53'.0	213° 42'.4	16'.8
17	87° 11'.3	72° 19'.5	5° 01'.1 N	71° 02'.0	17'.3	16° 18'.7	53'.1	228° 45'.0	16'.8
18	102° 13'.8	87° 19'.1	02'.3	86° 02'.7	18'.1	31° 20'.7	53'.2	243° 47'.6	16'.7
19	117° 16'.2	102° 18'.7	03'.6	101° 03'.4	18'.8	46° 22'.7	53'.2	258° 50'.2	16'.7
20	132° 18'.7	117° 18'.3	04'.8	116° 04'.1	19'.6	61° 24'.7	53'.3	273° 52'.9	16'.6
21	147° 21'.1	132° 17'.9	06'.0	131° 04'.8	20'.3	76° 26'.7	53'.3	288° 55'.5	16'.6
22	162° 23'.6	147° 17'.5	07'.3	146° 05'.5	21'.1	91° 28'.7	53'.4	303° 58'.1	16'.5
23	177° 26'.1	162° 17'.1	08'.5	161° 06'.2	21'.8	106° 30'.7	53'.5	319° 00'.7	16'.4
	M.P. 11:12	v -0'.4	d 1'.2	v 0'.7	d 0'.8	v 2'.0	d 0'.1	v 2'.6	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.3 S
Achernar	335° 27'.5	57° 10'.3 S
Acrux	173° 08'.7	63° 10'.5 S
Adhara	255° 12'.6	28° 59'.8 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.1 N
Alkaid	152° 58'.6	49° 14'.7 N
Alnair	27° 44'.3	46° 53'.6 S
Alnilam	275° 46'.6	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 10'.9	26° 40'.1 N
Alpheratz	357° 44'.0	29° 09'.7 N
Altair	62° 08'.4	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.1 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.9	69° 02'.7 S
Avior	234° 17'.8	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.5	7° 24'.3 N
Canopus	263° 56'.3	52° 42'.6 S
Capella	280° 34'.8	46° 00'.6 N
Deneb	49° 31'.8	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 54'.9 S
Dubhe	193° 51'.3	61° 40'.7 N
Elnath	278° 12'.9	28° 37'.0 N
Eltanin	90° 46'.1	51° 29'.0 N
Enif	33° 47'.5	9° 56'.1 N
Fomalhaut	15° 24'.5	29° 33'.0 S
Gacrux	172° 00'.4	57° 11'.4 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.4	60° 26'.2 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.9	34° 22'.5 S
Kochab	137° 19'.1	74° 05'.9 N
Markab	13° 38'.7	15° 16'.5 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.3	36° 26'.1 S
Miaplacidus	221° 39'.1	69° 46'.7 S
Mirfak	308° 40'.9	49° 54'.5 N
Nunki	75° 58'.5	26° 16'.6 S
Peacock	53° 19'.7	56° 41'.2 S
Polaris	318° 13'.9	89° 19'.4 N
Pollux	243° 27'.8	27° 59'.5 N
Procyon	244° 59'.8	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.3	8° 11'.5 S
Rigil Kent	139° 51'.3	60° 53'.3 S
Sabik	102° 12'.6	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.6 N
Shaula	96° 22'.0	37° 06'.6 S
Sirius	258° 33'.8	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.3	43° 29'.6 S
Vega	80° 39'.0	38° 47'.6 N
Zuben'ubi	137° 05'.3	16° 05'.9 S

	SHA	Mer.Pass.
Venus	347° 05'.1	12:10
Mars	345° 03'.0	12:17
Jupiter	289° 25'.8	15:58
Saturn	141° 27'.5	01:52

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
1 Monday 00	179° 01'.0	4° 31'.1 N	298° 16'.5	5'.3	20° 05'.0 S	1'.6	59'.6
01	194° 01'.2	32'.1	312° 40'.8	5'.3	06'.6	1'.5	
02	209° 01'.4	33'.0	327° 05'.1	5'.3	08'.1	1'.3	
03	224° 01'.6	34'.0	341° 29'.4	5'.3	09'.4	1'.2	
04	239° 01'.7	35'.0	355° 53'.7	5'.3	10'.6	1'.0	
05	254° 01'.9	35'.9	10° 18'.0	5'.3	11'.6	0'.9	
06	269° 02'.1	36'.9	24° 42'.3	5'.3	12'.5	0'.7	
07	284° 02'.3	37'.9	39° 06'.6	5'.3	13'.2	0'.7	
08	299° 02'.5	38'.8	53° 30'.9	5'.3	13'.9	0'.4	
09	314° 02'.7	39'.8	67° 55'.2	5'.4	14'.3	0'.4	
10	329° 02'.9	40'.8	82° 19'.6	5'.3	14'.7	0'.2	
11	344° 03'.0	41'.7	96° 43'.9	5'.3	14'.9	0'.1	
12	359° 03'.2	4° 42'.7 N	111° 08'.2	5'.4	20° 15'.0 S	0'.1	59'.5
13	14° 03'.4	43'.6	125° 32'.6	5'.3	14'.9	0'.2	
14	29° 03'.6	44'.6	139° 56'.9	5'.4	14'.7	0'.3	
15	44° 03'.8	45'.6	154° 21'.3	5'.4	14'.4	0'.5	
16	59° 04'.0	46'.5	168° 45'.7	5'.4	13'.9	0'.6	
17	74° 04'.2	47'.5	183° 10'.1	5'.4	13'.3	0'.8	
18	89° 04'.3	48'.5	197° 34'.5	5'.5	12'.5	0'.9	
19	104° 04'.5	49'.4	211° 59'.0	5'.4	11'.6	1'.0	
20	119° 04'.7	50'.4	226° 23'.4	5'.5	10'.6	1'.1	
21	134° 04'.9	51'.3	240° 47'.9	5'.5	09'.5	1'.3	
22	149° 05'.1	52'.3	255° 12'.4	5'.6	08'.2	1'.5	
23	164° 05'.3	53'.3	269° 37'.0	5'.5	06'.7	1'.5	
2 Tuesday 00	179° 05'.5	4° 54'.2 N	284° 01'.5	5'.6	20° 05'.2 S	1'.7	59'.4
01	194° 05'.6	55'.2	298° 26'.1	5'.6	03'.5	1'.9	
02	209° 05'.8	56'.1	312° 50'.7	5'.7	01'.6	1'.9	
03	224° 06'.0	57'.1	327° 15'.4	5'.6	19° 59'.7 S	2'.1	
04	239° 06'.2	58'.1	341° 40'.0	5'.7	57'.6	2'.2	
05	254° 06'.4	59'.0	356° 04'.7	5'.8	55'.4	2'.4	
06	269° 06'.6	00'.0	10° 29'.5	5'.8	53'.0	2'.5	
07	284° 06'.7	5° 01'.0 N	24° 54'.3	5'.8	50'.5	2'.6	
08	299° 06'.9	01'.9	39° 19'.1	5'.8	47'.9	2'.8	
09	314° 07'.1	02'.9	53° 43'.9	5'.9	45'.1	2'.9	
10	329° 07'.3	03'.8	68° 08'.8	5'.9	42'.2	3'.0	59'.3
11	344° 07'.5	04'.8	82° 33'.7	5'.9	39'.2	3'.1	
12	359° 07'.7	5° 05'.8 N	96° 58'.6	6'.0	19° 36'.1 S	3'.3	59'.3
13	14° 07'.9	06'.7	111° 23'.6	6'.1	32'.8	3'.4	
14	29° 08'.0	07'.7	125° 48'.7	6'.0	29'.4	3'.5	
15	44° 08'.2	08'.6	140° 13'.7	6'.2	25'.9	3'.7	
16	59° 08'.4	09'.6	154° 38'.9	6'.1	22'.2	3'.7	
17	74° 08'.6	10'.5	169° 04'.0	6'.2	18'.5	3'.9	
18	89° 08'.8	11'.5	183° 29'.2	6'.3	14'.6	4'.1	59'.2
19	104° 09'.0	12'.5	197° 54'.5	6'.3	10'.5	4'.1	
20	119° 09'.1	13'.4	212° 19'.8	6'.3	06'.4	4'.3	
21	134° 09'.3	14'.4	226° 45'.1	6'.4	02'.1	4'.4	
22	149° 09'.5	15'.3	241° 10'.5	6'.5	18° 57'.7 S	4'.5	
23	164° 09'.7	16'.3	255° 36'.0	6'.5	53'.2	4'.6	
3 Wednesday 00	179° 09'.9	5° 17'.3 N	270° 01'.5	6'.5	18° 48'.6 S	4'.8	59'.2
01	194° 10'.1	18'.2	284° 27'.0	6'.6	43'.8	4'.8	
02	209° 10'.2	19'.2	298° 52'.6	6'.7	39'.0	5'.0	59'.1
03	224° 10'.4	20'.1	313° 18'.3	6'.7	34'.0	5'.1	
04	239° 10'.6	21'.1	327° 44'.0	6'.7	28'.9	5'.2	
05	254° 10'.8	22'.0	342° 09'.7	6'.8	23'.7	5'.4	
06	269° 11'.0	23'.0	356° 35'.5	6'.9	18'.3	5'.4	
07	284° 11'.2	24'.0	11° 01'.4	6'.9	12'.9	5'.6	
08	299° 11'.3	24'.9	25° 27'.3	7'.0	07'.3	5'.6	
09	314° 11'.5	25'.9	39° 53'.3	7'.0	01'.7	5'.8	
10	329° 11'.7	26'.8	54° 19'.3	7'.1	17° 55'.9 S	5'.9	59'.0
11	344° 11'.9	27'.8	68° 45'.4	7'.2	50'.0	6'.0	
12	359° 12'.1	5° 28'.7 N	83° 11'.6	7'.2	17° 44'.0 S	6'.1	59'.0
13	14° 12'.3	29'.7	97° 37'.8	7'.2	37'.9	6'.3	
14	29° 12'.4	30'.6	112° 04'.0	7'.3	31'.6	6'.3	
15	44° 12'.6	31'.6	126° 30'.3	7'.4	25'.3	6'.4	
16	59° 12'.8	32'.6	140° 56'.7	7'.5	18'.9	6'.5	
17	74° 13'.0	33'.5	155° 23'.2	7'.5	12'.4	6'.7	58'.9
18	89° 13'.2	34'.5	169° 49'.7	7'.5	05'.7	6'.7	
19	104° 13'.3	35'.4	184° 16'.2	7'.6	16° 59'.0 S	6'.9	
20	119° 13'.5	36'.4	198° 42'.8	7'.7	52'.1	6'.9	
21	134° 13'.7	37'.3	213° 09'.5	7'.7	45'.2	7'.0	
22	149° 13'.9	38'.3	227° 36'.2	7'.8	38'.2	7'.2	
23	164° 14'.1	39'.2	242° 03'.0	7'.9	31'.0	7'.2	
	SD 16'.0	d 1'.0	SD 16'.2		16'.2	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3
N 72°	01:23	03:34	04:50	-	-	-
N 70°	02:12	03:51	04:58	-	-	04:40
68°	02:42	04:05	05:05	02:39	03:33	03:55
66°	03:03	04:16	05:10	01:56	02:53	03:25
64°	03:20	04:25	05:15	01:27	02:25	03:03
62°	03:34	04:32	05:19	01:06	02:04	02:45
60°	03:45	04:39	05:22	00:48	01:46	02:30
N 58°	03:55	04:45	05:25	00:33	01:32	02:17
56°	04:03	04:50	05:28	00:21	01:19	02:06
54°	04:10	04:54	05:30	00:09	01:09	01:56
52°	04:17	04:58	05:32	-	00:59	01:48
50°	04:22	05:02	05:34	-	00:50	01:40
45°	04:34	05:09	05:39	-	00:32	01:23
N 40°	04:43	05:15	05:42	-	00:17	01:09
35°	04:50	05:20	05:45	-	00:04	00:58
30°	04:56	05:24	05:48	23:53	-	00:48
20°	05:05	05:31	05:53	23:34	-	00:30
N 10°	05:11	05:36	05:57	23:18	-	00:15
0°	05:15	05:39	06:00	23:02	-	00:01
S 10°	05:18	05:43	06:04	22:47	23:46	24:44
20°	05:20	05:45	06:07	22:30	23:31	24:31
30°	05:20	05:47	06:11	22:12	23:13	24:16
35°	05:19	05:48	06:14	22:01	23:03	24:08
40°	05:18	05:49	06:16	21:48	22:51	23:58
45°	05:16	05:50	06:19	21:33	22:38	23:46
S 50°	05:13	05:50	06:22	21:15	22:21	23:32
52°	05:11	05:50	06:24	21:06	22:13	23:25
54°	05:09	05:50	06:26	20:57	22:04	23:17
56°	05:07	05:50	06:27	20:46	21:54	23:09
58°	05:05	05:50	06:29	20:33	21:42	23:00
S 60°	05:02	05:50	06:32	20:19	21:29	22:49
S 62°	04:58	05:50	06:34	20:02	21:14	22:36

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 1	Moonset 2	Moonset 3
N 72°	19:20	20:37	22:58	-	-	-
N 70°	19:12	20:19	22:02	-	-	07:57
68°	19:05	20:05	21:30	05:54	07:04	08:42
66°	18:59	19:54	21:07	06:36	07:43	09:11
64°	18:54	19:44	20:50	07:05	08:11	09:33
62°	18:50	19:37	20:36	07:27	08:32	09:51
60°	18:47	19:30	20:24	07:45	08:49	10:05
N 58°	18:43	19:24	20:14	08:00	09:03	10:17
56°	18:40	19:19	20:06	08:13	09:16	10:28
54°	18:38	19:14	19:58	08:24	09:27	10:38
52°	18:36	19:10	19:52	08:33	09:36	10:46
50°	18:34	19:07	19:46	08:42	09:45	10:53
45°	18:29	18:59	19:34	09:01	10:03	11:09
N 40°	18:25	18:53	19:25	09:16	10:17	11:22
35°	18:22	18:48	19:18	09:29	10:30	11:34
30°	18:19	18:43	19:12	09:40	10:41	11:43
20°	18:15	18:37	19:03	09:59	10:59	12:00
N 10°	18:10	18:32	18:56	10:16	11:15	12:14
0°	18:07	18:28	18:52	10:31	11:30	12:28
S 10°	18:03	18:24	18:49	10:47	11:45	12:41
20°	17:59	18:21	18:47	11:03	12:01	12:55
30°	17:55	18:19	18:47	11:22	12:19	13:11
35°	17:53	18:18	18:47	11:33	12:30	13:21
40°	17:50	18:17	18:49	11:46	12:42	13:31
45°	17:47	18:17	18:51	12:01	12:57	13:44
S 50°	17:44	18:16	18:53	12:19	13:14	13:59
52°	17:42	18:16	18:55	12:28	13:22	14:06
54°	17:40	18:16	18:57	12:38	13:31	14:14
56°	17:39	18:16	18:59	12:49	13:41	14:23
58°	17:36	18:15	19:01	13:01	13:53	14:33
S 60°	17:34	18:15	19:04	13:16	14:07	14:44
S 62°	17:31	18:15	19:07	13:33	14:22	14:57

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
1	3 56	3 47	12:04	04:17	16:47	21d 69%
2	3 39	3 30	12:03	05:16	17:45	22d 58%
3	3 21	3 12	12:03	06:14	18:42	23d 47%

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2013 April 4, 5, 6 (Thur, Fri, Sat)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.1		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
4 Thursday 00	192° 28'.5	177° 16'.7	5° 09'.8 N	176° 06'.9	6° 22'.6 N	121° 32'.7	21° 53'.5 N	334° 03'.3	12° 16'.4 S
01	207° 31'.0	192° 16'.4	11'.0	191° 07'.6	23'.3	136° 34'.8	53'.6	349° 06'.0	16'.3
02	222° 33'.5	207° 16'.0	12'.2	206° 08'.3	24'.1	151° 36'.8	53'.7	4° 08'.6	16'.3
03	237° 35'.9	222° 15'.6	13'.5	221° 09'.0	24'.8	166° 38'.8	53'.7	19° 11'.2	16'.2
04	252° 38'.4	237° 15'.2	14'.7	236° 09'.7	25'.6	181° 40'.8	53'.8	34° 13'.8	16'.2
05	267° 40'.9	252° 14'.8	15'.9	251° 10'.4	26'.3	196° 42'.8	53'.8	49° 16'.4	16'.1
06	282° 43'.3	267° 14'.4	17'.2	266° 11'.1	27'.1	211° 44'.8	53'.9	64° 19'.1	16'.1
07	297° 45'.8	282° 14'.0	18'.4	281° 11'.8	27'.8	226° 46'.8	54'.0	79° 21'.7	16'.0
08	312° 48'.3	297° 13'.6	19'.7	296° 12'.5	28'.6	241° 48'.8	54'.0	94° 24'.3	16'.0
09	327° 50'.7	312° 13'.2	20'.9	311° 13'.2	29'.3	256° 50'.8	54'.1	109° 26'.9	15'.9
10	342° 53'.2	327° 12'.8	22'.1	326° 13'.9	30'.1	271° 52'.8	54'.1	124° 29'.5	15'.8
11	357° 55'.6	342° 12'.4	23'.4	341° 14'.6	30'.8	286° 54'.8	54'.2	139° 32'.2	15'.8
12	12° 58'.1	357° 12'.0	5° 24'.6 N	356° 15'.3	6° 31'.6 N	301° 56'.8	21° 54'.3 N	154° 34'.8	12° 15'.7 S
13	28° 00'.6	12° 11'.6	25'.8	11° 16'.0	32'.3	316° 58'.9	54'.3	169° 37'.4	15'.7
14	43° 03'.0	27° 11'.2	27'.1	26° 16'.7	33'.1	332° 00'.9	54'.4	184° 40'.0	15'.6
15	58° 05'.5	42° 10'.9	28'.3	41° 17'.4	33'.8	347° 02'.9	54'.5	199° 42'.6	15'.6
16	73° 08'.0	57° 10'.5	29'.6	56° 18'.1	34'.6	2° 04'.9	54'.5	214° 45'.3	15'.5
17	88° 10'.4	72° 10'.1	30'.8	71° 18'.8	35'.3	17° 06'.9	54'.6	229° 47'.9	15'.5
18	103° 12'.9	87° 09'.7	32'.0	86° 19'.5	36'.1	32° 08'.9	54'.6	244° 50'.5	15'.4
19	118° 15'.4	102° 09'.3	33'.3	101° 20'.2	36'.8	47° 10'.9	54'.7	259° 53'.1	15'.4
20	133° 17'.8	117° 08'.9	34'.5	116° 20'.9	37'.6	62° 12'.9	54'.8	274° 55'.7	15'.3
21	148° 20'.3	132° 08'.5	35'.7	131° 21'.6	38'.3	77° 14'.9	54'.8	289° 58'.4	15'.2
22	163° 22'.7	147° 08'.1	37'.0	146° 22'.3	39'.1	92° 16'.9	54'.9	305° 01'.0	15'.2
23	178° 25'.2	162° 07'.7	38'.2	161° 23'.0	39'.8	107° 18'.9	55'.0	320° 03'.6	15'.1
5 Friday 00	193° 27'.7	177° 07'.3	5° 39'.4 N	176° 23'.7	6° 40'.6 N	122° 20'.9	21° 55'.0 N	335° 06'.2	12° 15'.1 S
01	208° 30'.1	192° 06'.9	40'.7	191° 24'.4	41'.3	137° 22'.9	55'.1	350° 08'.8	15'.0
02	223° 32'.6	207° 06'.5	41'.9	206° 25'.1	42'.0	152° 24'.9	55'.1	5° 11'.5	15'.0
03	238° 35'.1	222° 06'.1	43'.1	221° 25'.8	42'.8	167° 26'.9	55'.2	20° 14'.1	14'.9
04	253° 37'.5	237° 05'.7	44'.4	236° 26'.5	43'.5	182° 28'.9	55'.3	35° 16'.7	14'.9
05	268° 40'.0	252° 05'.3	45'.6	251° 27'.2	44'.3	197° 30'.9	55'.3	50° 19'.3	14'.8
06	283° 42'.5	267° 04'.9	46'.8	266° 27'.9	45'.0	212° 33'.0	55'.4	65° 21'.9	14'.7
07	298° 44'.9	282° 04'.5	48'.1	281° 28'.6	45'.8	227° 35'.0	55'.4	80° 24'.6	14'.7
08	313° 47'.4	297° 04'.1	49'.3	296° 29'.3	46'.5	242° 37'.0	55'.5	95° 27'.2	14'.6
09	328° 49'.9	312° 03'.7	50'.5	311° 30'.0	47'.3	257° 39'.0	55'.6	110° 29'.8	14'.6
10	343° 52'.3	327° 03'.3	51'.8	326° 30'.7	48'.0	272° 41'.0	55'.6	125° 32'.4	14'.5
11	358° 54'.8	342° 02'.9	53'.0	341° 31'.4	48'.8	287° 43'.0	55'.7	140° 35'.1	14'.5
12	13° 57'.2	357° 02'.6	5° 54'.2 N	356° 32'.1	6° 49'.5 N	302° 45'.0	21° 55'.8 N	155° 37'.7	12° 14'.4 S
13	28° 59'.7	12° 02'.2	55'.5	11° 32'.8	50'.3	317° 47'.0	55'.8	170° 40'.3	14'.4
14	44° 02'.2	27° 01'.8	56'.7	26° 33'.5	51'.0	332° 49'.0	55'.9	185° 42'.9	14'.3
15	59° 04'.6	42° 01'.4	57'.9	41° 34'.2	51'.8	347° 51'.0	55'.9	200° 45'.5	14'.2
16	74° 07'.1	57° 01'.0	59'.1	56° 34'.9	52'.5	2° 53'.0	56'.0	215° 48'.2	14'.2
17	89° 09'.6	72° 00'.6	6° 00'.4 N	71° 35'.6	53'.2	17° 55'.0	56'.1	230° 50'.8	14'.1
18	104° 12'.0	87° 00'.2	01'.6	86° 36'.3	54'.0	32° 57'.0	56'.1	245° 53'.4	14'.1
19	119° 14'.5	101° 59'.8	02'.8	101° 37'.0	54'.7	47° 59'.0	56'.2	260° 56'.0	14'.0
20	134° 17'.0	116° 59'.4	04'.1	116° 37'.7	55'.5	63° 01'.0	56'.3	275° 58'.7	14'.0
21	149° 19'.4	131° 59'.0	05'.3	131° 38'.4	56'.2	78° 03'.0	56'.3	291° 01'.3	13'.9
22	164° 21'.9	146° 58'.6	06'.5	146° 39'.1	57'.0	93° 05'.0	56'.4	306° 03'.9	13'.9
23	179° 24'.3	161° 58'.2	07'.8	161° 39'.8	57'.7	108° 07'.0	56'.4	321° 06'.5	13'.8
6 Saturday 00	194° 26'.8	176° 57'.8	6° 09'.0 N	176° 40'.4	6° 58'.5 N	123° 09'.0	21° 56'.5 N	336° 09'.2	12° 13'.7 S
01	209° 29'.3	191° 57'.4	10'.2	191° 41'.1	59'.2	138° 11'.0	56'.6	351° 11'.8	13'.7
02	224° 31'.7	206° 57'.0	11'.4	206° 41'.8	59'.9	153° 13'.0	56'.6	6° 14'.4	13'.6
03	239° 34'.2	221° 56'.6	12'.7	221° 42'.5	7° 00'.7 N	168° 15'.0	56'.7	21° 17'.0	13'.6
04	254° 36'.7	236° 56'.2	13'.9	236° 43'.2	01'.4	183° 17'.0	56'.7	36° 19'.6	13'.5
05	269° 39'.1	251° 55'.8	15'.1	251° 43'.9	02'.2	198° 19'.0	56'.8	51° 22'.3	13'.5
06	284° 41'.6	266° 55'.4	16'.3	266° 44'.6	02'.9	213° 21'.0	56'.9	66° 24'.9	13'.4
07	299° 44'.1	281° 55'.0	17'.6	281° 45'.3	03'.7	228° 23'.0	56'.9	81° 27'.5	13'.4
08	314° 46'.5	296° 54'.6	18'.8	296° 46'.0	04'.4	243° 25'.0	57'.0	96° 30'.1	13'.3
09	329° 49'.0	311° 54'.2	20'.0	311° 46'.7	05'.1	258° 27'.0	57'.1	111° 32'.8	13'.2
10	344° 51'.5	326° 53'.8	21'.3	326° 47'.4	05'.9	273° 29'.0	57'.1	126° 35'.4	13'.2
11	359° 53'.9	341° 53'.4	22'.5	341° 48'.1	06'.6	288° 31'.0	57'.2	141° 38'.0	13'.1
12	14° 56'.4	356° 53'.0	6° 23'.7 N	356° 48'.8	7° 07'.4 N	303° 33'.0	21° 57'.2 N	156° 40'.6	12° 13'.1 S
13	29° 58'.8	11° 52'.6	24'.9	11° 49'.5	08'.1	318° 35'.0	57'.3	171° 43'.3	13'.0
14	45° 01'.3	26° 52'.2	26'.2	26° 50'.2	08'.9	333° 37'.0	57'.4	186° 45'.9	13'.0
15	60° 03'.8	41° 51'.8	27'.4	41° 50'.9	09'.6	348° 39'.0	57'.4	201° 48'.5	12'.9
16	75° 06'.2	56° 51'.4	28'.6	56° 51'.6	10'.3	3° 41'.0	57'.5	216° 51'.1	12'.9
17	90° 08'.7	71° 51'.0	29'.8	71° 52'.3	11'.1	18° 43'.0	57'.6	231° 53'.8	12'.8
18	105° 11'.2	86° 50'.6	31'.1	86° 53'.0	11'.8	33° 45'.0	57'.6	246° 56'.4	12'.7
19	120° 13'.6	101° 50'.1	32'.3	101° 53'.7	12'.6	48° 47'.0	57'.7	261° 59'.0	12'.7
20	135° 16'.1	116° 49'.7	33'.5	116° 54'.4	13'.3	63° 49'.0	57'.7	277° 01'.6	12'.6
21	150° 18'.6	131° 49'.3	34'.7	131° 55'.1	14'.1	78° 51'.0	57'.8	292° 04'.3	12'.6
22	165° 21'.0	146° 48'.9	36'.0	146° 55'.8	14'.8	93° 53'.0	57'.9	307° 06'.9	12'.5
23	180° 23'.5	161° 48'.5	37'.2	161° 56'.5	15'.5	108° 54'.9	57'.9	322° 09'.5	12'.5
	M.P. 11:00	v -0'.4	d 1'.2	v 0'.7	d 0'.7	v 2'.0	d 0'.1	v 2'.6	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.3 S
Achernar	335° 27'.5	57° 10'.3 S
Acrux	173° 08'.7	63° 10'.5 S
Adhara	255° 12'.6	28° 59'.8 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.2 N
Alkaid	152° 58'.5	49° 14'.7 N
Alnair	27° 44'.2	46° 53'.6 S
Alnilam	275° 46'.6	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 10'.8	26° 40'.1 N
Alpheratz	357° 44'.0	29° 09'.7 N
Altair	62° 08'.4	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.0 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.8	69° 02'.8 S
Avior	234° 17'.8	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.5	7° 24'.3 N
Canopus	263° 56'.3	52° 42'.6 S
Capella	280° 34'.8	46° 00'.6 N
Deneb	49° 31'.7	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.4	17° 54'.9 S
Dubhe	193° 51'.3	61° 40'.7 N
Elnath	278° 12'.9	28° 37'.0 N
Eltanin	90° 46'.0	51° 29'.0 N
Enif	33° 47'.4	9° 56'.1 N
Fomalhaut	15° 24'.4	29° 33'.0 S
Gacrux	172° 00'.4	57° 11'.4 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.2 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.9	34° 22'.5 S
Kochab	137° 19'.0	74° 05'.9 N
Markab	13° 38'.7	15° 16'.5 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.2	69° 46'.7 S
Mirfak	308° 40'.9	49° 54'.5 N
Nunki	75° 58'.5	26° 16'.6 S
Peacock	53° 19'.7	56° 41'.2 S
Polaris	318° 14'.5	89° 19'.4 N
Pollux	243° 27'.8	27° 59'.5 N
Procyon	244° 59'.8	5° 11'.2 N
Rasalhague	96° 06'.4	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.3	8° 11'.5 S
Rigil Kent	139° 51'.2	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.6 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.9	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.3	43° 29'.6 S
Vega	80° 39'.0	38° 47'.6 N
Zuben'ubi	137° 05'.3	16° 05'.9 S

	SHA	Mer.Pass.
Venus	343° 39'.6	12:12
Mars	342° 56'.0	12:14
Jupiter	288° 53'.2	15:48
Saturn	141° 38'.5	01:39

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
179° 14'.3	5° 40'.2 N	256° 29'.9	7'.9	16° 23'.8 S	7'.4	58'.8
194° 14'.4	41'.1	270° 56'.8	8'.0	16'.4	7'.4	
209° 14'.6	42'.1	285° 23'.8	8'.1	09'.0	7'.5	
224° 14'.8	43'.1	299° 50'.9	8'.1	01'.5	7'.6	
239° 15'.0	44'.0	314° 18'.0	8'.2	15° 53'.9 S	7'.7	
254° 15'.2	45'.0	328° 45'.2	8'.2	46'.2	7'.8	
269° 15'.3	45'.9	343° 12'.4	8'.3	38'.4	7'.9	58'.7
284° 15'.5	46'.9	357° 39'.7	8'.3	30'.5	8'.0	
299° 15'.7	47'.8	12° 07'.0	8'.5	22'.5	8'.0	
314° 15'.9	48'.8	26° 34'.5	8'.5	14'.5	8'.2	
329° 16'.1	49'.7	41° 02'.0	8'.5	06'.3	8'.2	
344° 16'.2	50'.7	55° 29'.5	8'.6	14° 58'.1 S	8'.3	
359° 16'.4	5° 51'.6 N	69° 57'.1	8'.7	14° 49'.8 S	8'.4	58'.7
14° 16'.6	52'.6	84° 24'.8	8'.7	41'.4	8'.5	58'.6
29° 16'.8	53'.5	98° 52'.5	8'.8	32'.9	8'.6	
44° 17'.0	54'.5	113° 20'.3	8'.9	24'.3	8'.6	
59° 17'.2	55'.4	127° 48'.2	8'.9	15'.7	8'.8	
74° 17'.3	56'.4	142° 16'.1	9'.0	06'.9	8'.8	
89° 17'.5	57'.3	156° 44'.1	9'.0	13° 58'.1 S	8'.8	
104° 17'.7	58'.3	171° 12'.1	9'.1	49'.3	9'.0	58'.5
119° 17'.9	59'.2	185° 40'.2	9'.2	40'.3	9'.0	
134° 18'.1	6° 00'.2 N	200° 08'.4	9'.2	31'.3	9'.1	
149° 18'.2	01'.1	214° 36'.6	9'.3	22'.2	9'.2	
164° 18'.4	02'.1	229° 04'.9	9'.4	13'.0	9'.2	
179° 18'.6	6° 03'.0 N	243° 33'.3	9'.4	13° 03'.8 S	9'.3	58'.5
194° 18'.8	04'.0	258° 01'.7	9'.4	12° 54'.5 S	9'.4	58'.4
209° 19'.0	04'.9	272° 30'.1	9'.6	45'.1	9'.4	
224° 19'.1	05'.9	286° 58'.7	9'.5	35'.7	9'.6	
239° 19'.3	06'.8	301° 27'.2	9'.7	26'.1	9'.5	
254° 19'.5	07'.8	315° 55'.9	9'.7	16'.6	9'.7	
269° 19'.7	08'.7	330° 24'.6	9'.8	06'.9	9'.7	
284° 19'.8	09'.7	344° 53'.4	9'.8	11° 57'.2 S	9'.7	58'.3
299° 20'.0	10'.6	359° 22'.2	9'.9	47'.5	9'.9	
314° 20'.2	11'.6	13° 51'.1	9'.9	37'.6	9'.8	
329° 20'.4	12'.5	28° 20'.0	10'.0	27'.8	10'.0	
344° 20'.6	13'.5	42° 49'.0	10'.1	17'.8	10'.0	
359° 20'.7	6° 14'.4 N	57° 18'.1	10'.1	11° 07'.8 S	10'.0	58'.2
14° 20'.9	15'.4	71° 47'.2	10'.1	10° 57'.8 S	10'.1	
29° 21'.1	16'.3	86° 16'.3	10'.2	47'.7	10'.2	
44° 21'.3	17'.3	100° 45'.5	10'.3	37'.5	10'.2	
59° 21'.5	18'.2	115° 14'.8	10'.4	27'.3	10'.3	
74° 21'.6	19'.1	129° 44'.2	10'.3	17'.0	10'.3	
89° 21'.8	20'.1	144° 13'.5	10'.5	06'.7	10'.4	58'.1
104° 22'.0	21'.0	158° 43'.0	10'.5	9° 56'.3 S	10'.4	
119° 22'.2	22'.0	173° 12'.5	10'.5	45'.9	10'.5	
134° 22'.3	22'.9	187° 42'.0	10'.6	35'.4	10'.5	
149° 22'.5	23'.9	202° 11'.6	10'.6	24'.9	10'.5	
164° 22'.7	24'.8	216° 41'.2	10'.7	14'.4	10'.6	
179° 22'.9	6° 25'.8 N	231° 10'.9	10'.8	9° 03'.8 S	10'.7	58'.0
194° 23'.1	26'.7	245° 40'.7	10'.8	8° 53'.1 S	10'.6	
209° 23'.2	27'.7	260° 10'.5	10'.8	42'.5	10'.8	
224° 23'.4	28'.6	274° 40'.3	10'.9	31'.7	10'.7	
239° 23'.6	29'.5	289° 10'.2	10'.9	21'.0	10'.8	
254° 23'.8	30'.5	303° 40'.1	11'.0	10'.2	10'.8	57'.9
269° 23'.9	31'.4	318° 10'.1	11'.1	7° 59'.4 S	10'.9	
284° 24'.1	32'.4	332° 40'.2	11'.1	48'.5	10'.9	
299° 24'.3	33'.3	347° 10'.3	11'.1	37'.6	11'.0	
314° 24'.5	34'.3	1° 40'.4	11'.2	26'.6	10'.9	
329° 24'.6	35'.2	16° 10'.6	11'.2	15'.7	11'.0	57'.8
344° 24'.8	36'.2	30° 40'.8	11'.2	04'.7	11'.1	
359° 25'.0	6° 37'.1 N	45° 11'.0	11'.3	6° 53'.6 S	11'.0	57'.8
14° 25'.2	38'.0	59° 41'.3	11'.4	42'.6	11'.1	
29° 25'.4	39'.0	74° 11'.7	11'.4	31'.5	11'.1	
44° 25'.5	39'.9	88° 42'.1	11'.4	20'.4	11'.2	
59° 25'.7	40'.9	103° 12'.5	11'.5	09'.2	11'.2	57'.7
74° 25'.9	41'.8	117° 43'.0	11'.5	5° 58'.0 S	11'.2	
89° 26'.1	42'.8	132° 13'.5	11'.5	46'.8	11'.2	
104° 26'.2	43'.7	146° 44'.0	11'.6	35'.6	11'.2	
119° 26'.4	44'.6	161° 14'.6	11'.7	24'.4	11'.3	
134° 26'.6	45'.6	175° 45'.3	11'.6	13'.1	11'.3	57'.6
149° 26'.8	46'.5	190° 15'.9	11'.7	01'.8	11'.3	
164° 26'.9	47'.5	204° 46'.6	11'.8	4° 50'.5 S	11'.3	
SD 16'.0	d 0'.9	SD	16'.0	15'.9	15'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6
N 72°	-	03:15	04:34	05:10	04:47	04:32
N 70°	01:44	03:35	04:44	04:31	04:25	04:20
68°	02:22	03:50	04:52	04:04	04:08	04:10
66°	02:47	04:03	04:58	03:44	03:55	04:02
64°	03:06	04:13	05:04	03:27	03:43	03:55
62°	03:22	04:22	05:09	03:13	03:33	03:49
60°	03:34	04:29	05:13	03:01	03:25	03:43
N 58°	03:45	04:36	05:17	02:51	03:17	03:38
56°	03:54	04:41	05:20	02:42	03:11	03:34
54°	04:02	04:46	05:23	02:34	03:05	03:30
52°	04:09	04:51	05:26	02:27	03:00	03:27
50°	04:15	04:55	05:28	02:21	02:55	03:24
45°	04:28	05:03	05:33	02:07	02:44	03:17
N 40°	04:38	05:10	05:38	01:55	02:35	03:11
35°	04:46	05:16	05:41	01:46	02:28	03:06
30°	04:52	05:20	05:45	01:37	02:21	03:02
20°	05:02	05:28	05:50	01:22	02:10	02:54
N 10°	05:09	05:34	05:55	01:09	02:00	02:48
0°	05:14	05:39	05:59	00:57	01:50	02:41
S 10°	05:18	05:43	06:04	00:44	01:41	02:35
20°	05:20	05:46	06:08	00:31	01:31	02:28
30°	05:21	05:49	06:13	00:16	01:19	02:20
35°	05:21	05:51	06:16	00:08	01:12	02:16
40°	05:21	05:52	06:19	-	01:05	02:11
45°	05:19	05:53	06:23	-	00:56	02:05
S 50°	05:17	05:55	06:27	-	00:45	01:58
52°	05:16	05:55	06:29	-	00:40	01:55
54°	05:15	05:56	06:31	-	00:34	01:51
56°	05:13	05:56	06:33	-	00:28	01:47
58°	05:11	05:57	06:36	-	00:21	01:43
S 60°	05:09	05:57	06:39	-	00:13	01:38
S 62°	05:06	05:58	06:42	-	00:04	01:32

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 4	Moonset 5	Moonset 6
N 72°	19:34	20:55	-	09:24	11:38	13:37
N 70°	19:24	20:34	22:30	10:02	11:58	13:47
68°	19:16	20:18	21:49	10:28	12:13	13:56
66°	19:09	20:05	21:22	10:48	12:26	14:02
64°	19:03	19:54	21:02	11:04	12:36	14:08
62°	18:58	19:45	20:46	11:17	12:45	14:13
60°	18:54	19:38	20:33	11:28	12:53	14:17
N 58°	18:50	19:31	20:23	11:37	12:59	14:21
56°	18:47	19:25	20:13	11:46	13:05	14:24
54°	18:44	19:20	20:05	11:53	13:11	14:27
52°	18:41	19:16	19:58	12:00	13:15	14:30
50°	18:38	19:11	19:52	12:06	13:20	14:33
45°	18:33	19:03	19:39	12:19	13:29	14:38
N 40°	18:28	18:56	19:29	12:29	13:36	14:42
35°	18:25	18:50	19:20	12:38	13:43	14:46
30°	18:21	18:45	19:14	12:46	13:49	14:49
20°	18:15	18:38	19:04	13:00	13:58	14:55
N 10°	18:10	18:32	18:56	13:12	14:07	15:00
0°	18:06	18:27	18:51	13:23	14:15	15:05
S 10°	18:01	18:23	18:47	13:33	14:23	15:09
20°	17:57	18:19	18:45	13:45	14:31	15:14
30°	17:52	18:16	18:43	13:58	14:41	15:20
35°	17:49	18:14	18:43	14:06	14:46	15:23
40°	17:46	18:13	18:44	14:14	14:52	15:26
45°	17:42	18:11	18:45	14:24	14:59	15:31
S 50°	17:37	18:10	18:47	14:36	15:08	15:35
52°	17:35	18:09	18:48	14:42	15:12	15:38
54°	17:33	18:09	18:49	14:48	15:16	15:40
56°	17:31	18:08	18:51	14:55	15:21	15:43
58°	17:28	18:07	18:53	15:03	15:26	15:46
S 60°	17:25	18:07	18:55	15:11	15:32	15:49
S 62°	17:22	18:06	18:57	15:21	15:39	15:53

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
4	3 03	2 55	12:03	07:10	19:36	24d 36%
5	2 46	2 37	12:03	08:03	20:28	25d 25%
6	2 29	2 20	12:02	08:53	21:18	26d 16%

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2013 April 7, 8, 9 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.1		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
7 Sunday 00	195° 26'.0	176° 48'.1	6° 38'.4 N	176° 57'.2	7° 16'.3 N	123° 56'.9	21° 58'.0 N	337° 12'.1	12° 12'.4 S
01	210° 28'.4	191° 47'.7	39'.6	191° 57'.9	17'.0	138° 58'.9	58'.0	352° 14'.8	12'.3
02	225° 30'.9	206° 47'.3	40'.8	206° 58'.6	17'.8	154° 00'.9	58'.1	7° 17'.4	12'.3
03	240° 33'.3	221° 46'.9	42'.1	221° 59'.3	18'.5	169° 02'.9	58'.2	22° 20'.0	12'.2
04	255° 35'.8	236° 46'.5	43'.3	237° 00'.0	19'.2	184° 04'.9	58'.2	37° 22'.6	12'.2
05	270° 38'.3	251° 46'.1	44'.5	252° 00'.7	20'.0	199° 06'.9	58'.3	52° 25'.3	12'.1
06	285° 40'.7	266° 45'.7	45'.7	267° 01'.4	20'.7	214° 08'.9	58'.4	67° 27'.9	12'.1
07	300° 43'.2	281° 45'.3	47'.0	282° 02'.1	21'.5	229° 10'.9	58'.4	82° 30'.5	12'.0
08	315° 45'.7	296° 44'.9	48'.2	297° 02'.8	22'.2	244° 12'.9	58'.5	97° 33'.1	12'.0
09	330° 48'.1	311° 44'.5	49'.4	312° 03'.5	22'.9	259° 14'.9	58'.5	112° 35'.8	11'.9
10	345° 50'.6	326° 44'.1	50'.6	327° 04'.2	23'.7	274° 16'.9	58'.6	127° 38'.4	11'.8
11	0° 53'.1	341° 43'.7	51'.8	342° 04'.9	24'.4	289° 18'.9	58'.7	142° 41'.0	11'.8
12	15° 55'.5	356° 43'.3	6° 53'.1 N	357° 05'.6	7° 25'.2 N	304° 20'.9	21° 58'.7 N	157° 43'.7	12° 11'.7 S
13	30° 58'.0	11° 42'.9	54'.3	12° 06'.3	25'.9	319° 22'.9	58'.8	172° 46'.3	11'.7
14	46° 00'.4	26° 42'.5	55'.5	27° 07'.0	26'.6	334° 24'.9	58'.8	187° 48'.9	11'.6
15	61° 02'.9	41° 42'.0	56'.7	42° 07'.7	27'.4	349° 26'.9	58'.9	202° 51'.5	11'.6
16	76° 05'.4	56° 41'.6	57'.9	57° 08'.4	28'.1	4° 28'.9	59'.0	217° 54'.2	11'.5
17	91° 07'.8	71° 41'.2	59'.1	72° 09'.1	28'.8	19° 30'.8	59'.0	232° 56'.8	11'.4
18	106° 10'.3	86° 40'.8	7° 00'.4 N	87° 09'.8	29'.6	34° 32'.8	59'.1	247° 59'.4	11'.4
19	121° 12'.8	101° 40'.4	01'.6	102° 10'.5	30'.3	49° 34'.8	59'.2	263° 02'.0	11'.3
20	136° 15'.2	116° 40'.0	02'.8	117° 11'.2	31'.1	64° 36'.8	59'.2	278° 04'.7	11'.3
21	151° 17'.7	131° 39'.6	04'.0	132° 11'.8	31'.8	79° 38'.8	59'.3	293° 07'.3	11'.2
22	166° 20'.2	146° 39'.2	05'.2	147° 12'.5	32'.5	94° 40'.8	59'.3	308° 09'.9	11'.2
23	181° 22'.6	161° 38'.8	06'.5	162° 13'.2	33'.3	109° 42'.8	59'.4	323° 12'.5	11'.1
8 Monday 00	196° 25'.1	176° 38'.4	7° 07'.7 N	177° 13'.9	7° 34'.0 N	124° 44'.8	21° 59'.5 N	338° 15'.2	12° 11'.0 S
01	211° 27'.6	191° 38'.0	08'.9	192° 14'.6	34'.8	139° 46'.8	59'.5	353° 17'.8	11'.0
02	226° 30'.0	206° 37'.6	10'.1	207° 15'.3	35'.5	154° 48'.8	59'.6	8° 20'.4	10'.9
03	241° 32'.5	221° 37'.1	11'.3	222° 16'.0	36'.2	169° 50'.8	59'.7	23° 23'.1	10'.9
04	256° 34'.9	236° 36'.7	12'.5	237° 16'.7	37'.0	184° 52'.8	59'.7	38° 25'.7	10'.8
05	271° 37'.4	251° 36'.3	13'.7	252° 17'.4	37'.7	199° 54'.7	59'.8	53° 28'.3	10'.8
06	286° 39'.9	266° 35'.9	15'.0	267° 18'.1	38'.4	214° 56'.7	59'.8	68° 30'.9	10'.7
07	301° 42'.3	281° 35'.5	16'.2	282° 18'.8	39'.2	229° 58'.7	59'.9	83° 33'.6	10'.7
08	316° 44'.8	296° 35'.1	17'.4	297° 19'.5	39'.9	245° 00'.7	22° 00'.0 N	98° 36'.2	10'.6
09	331° 47'.3	311° 34'.7	18'.6	312° 20'.2	40'.6	260° 02'.7	00'.0	113° 38'.8	10'.5
10	346° 49'.7	326° 34'.3	19'.8	327° 20'.9	41'.4	275° 04'.7	00'.1	128° 41'.5	10'.5
11	1° 52'.2	341° 33'.9	21'.0	342° 21'.6	42'.1	290° 06'.7	00'.1	143° 44'.1	10'.4
12	16° 54'.7	356° 33'.4	7° 22'.2 N	357° 22'.3	7° 42'.8 N	305° 08'.7	22° 00'.2 N	158° 46'.7	12° 10'.4 S
13	31° 57'.1	11° 33'.0	23'.5	12° 23'.0	43'.6	320° 10'.7	00'.3	173° 49'.3	10'.3
14	46° 59'.6	26° 32'.6	24'.7	27° 23'.7	44'.3	335° 12'.6	00'.3	188° 52'.0	10'.3
15	62° 02'.0	41° 32'.2	25'.9	42° 24'.4	45'.1	350° 14'.6	00'.4	203° 54'.6	10'.2
16	77° 04'.5	56° 31'.8	27'.1	57° 25'.1	45'.8	5° 16'.6	00'.5	218° 57'.2	10'.1
17	92° 07'.0	71° 31'.4	28'.3	72° 25'.8	46'.5	20° 18'.6	00'.5	233° 59'.9	10'.1
18	107° 09'.4	86° 31'.0	29'.5	87° 26'.5	47'.3	35° 20'.6	00'.6	249° 02'.5	10'.0
19	122° 11'.9	101° 30'.6	30'.7	102° 27'.2	48'.0	50° 22'.6	00'.6	264° 05'.1	10'.0
20	137° 14'.4	116° 30'.1	31'.9	117° 27'.9	48'.7	65° 24'.6	00'.7	279° 07'.7	09'.9
21	152° 16'.8	131° 29'.7	33'.2	132° 28'.6	49'.5	80° 26'.6	00'.8	294° 10'.4	09'.9
22	167° 19'.3	146° 29'.3	34'.4	147° 29'.3	50'.2	95° 28'.6	00'.8	309° 13'.0	09'.8
23	182° 21'.8	161° 28'.9	35'.6	162° 30'.0	50'.9	110° 30'.5	00'.9	324° 15'.6	09'.7
9 Tuesday 00	197° 24'.2	176° 28'.5	7° 36'.8 N	177° 30'.7	7° 51'.7 N	125° 32'.5	22° 00'.9 N	339° 18'.3	12° 09'.7 S
01	212° 26'.7	191° 28'.1	38'.0	192° 31'.4	52'.4	140° 34'.5	01'.0	354° 20'.9	09'.6
02	227° 29'.2	206° 27'.7	39'.2	207° 32'.1	53'.1	155° 36'.5	01'.1	9° 23'.5	09'.6
03	242° 31'.6	221° 27'.2	40'.4	222° 32'.7	53'.9	170° 38'.5	01'.1	24° 26'.1	09'.5
04	257° 34'.1	236° 26'.8	41'.6	237° 33'.4	54'.6	185° 40'.5	01'.2	39° 28'.8	09'.5
05	272° 36'.5	251° 26'.4	42'.8	252° 34'.1	55'.3	200° 42'.5	01'.3	54° 31'.4	09'.4
06	287° 39'.0	266° 26'.0	44'.0	267° 34'.8	56'.1	215° 44'.4	01'.3	69° 34'.0	09'.3
07	302° 41'.5	281° 25'.6	45'.2	282° 35'.5	56'.8	230° 46'.4	01'.4	84° 36'.7	09'.3
08	317° 43'.9	296° 25'.2	46'.4	297° 36'.2	57'.5	245° 48'.4	01'.4	99° 39'.3	09'.2
09	332° 46'.4	311° 24'.8	47'.7	312° 36'.9	58'.3	260° 50'.4	01'.5	114° 41'.9	09'.2
10	347° 48'.9	326° 24'.3	48'.9	327° 37'.6	59'.0	275° 52'.4	01'.6	129° 44'.6	09'.1
11	2° 51'.3	341° 23'.9	50'.1	342° 38'.3	59'.7	290° 54'.4	01'.6	144° 47'.2	09'.1
12	17° 53'.8	356° 23'.5	7° 51'.3 N	357° 39'.0	8° 00'.5 N	305° 56'.4	22° 01'.7 N	159° 49'.8	12° 09'.0 S
13	32° 56'.3	11° 23'.1	52'.5	12° 39'.7	01'.2	320° 58'.3	01'.7	174° 52'.4	08'.9
14	47° 58'.7	26° 22'.7	53'.7	27° 40'.4	01'.9	336° 00'.3	01'.8	189° 55'.1	08'.9
15	63° 01'.2	41° 22'.2	54'.9	42° 41'.1	02'.6	351° 02'.3	01'.9	204° 57'.7	08'.8
16	78° 03'.6	56° 21'.8	56'.1	57° 41'.8	03'.4	6° 04'.3	01'.9	220° 00'.3	08'.8
17	93° 06'.1	71° 21'.4	57'.3	72° 42'.5	04'.1	21° 06'.3	02'.0	235° 03'.0	08'.7
18	108° 08'.6	86° 21'.0	58'.5	87° 43'.2	04'.8	36° 08'.3	02'.1	250° 05'.6	08'.7
19	123° 11'.0	101° 20'.6	59'.7	102° 43'.9	05'.6	51° 10'.2	02'.1	265° 08'.2	08'.6
20	138° 13'.5	116° 20'.2	8° 00'.9 N	117° 44'.6	06'.3	66° 12'.2	02'.2	280° 10'.9	08'.5
21	153° 16'.0	131° 19'.7	02'.1	132° 45'.3	07'.0	81° 14'.2	02'.2	295° 13'.5	08'.5
22	168° 18'.4	146° 19'.3	03'.3	147° 46'.0	07'.8	96° 16'.2	02'.3	310° 16'.1	08'.4
23	183° 20'.9	161° 18'.9	04'.5	162° 46'.7	08'.5	111° 18'.2	02'.4	325° 18'.8	08'.4
	M.P. 10:49	v -0'.4	d 1'.2	v 0'.7	d 0'.7	v 2'.0	d 0'.1	v 2'.6	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.8	40° 15'.3 S
Achernar	335° 27'.5	57° 10'.2 S
Acrux	173° 08'.7	63° 10'.5 S
Adhara	255° 12'.7	28° 59'.8 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.2 N
Alkaid	152° 58'.5	49° 14'.7 N
Alnair	27° 44'.2	46° 53'.6 S
Alnilam	275° 46'.6	1° 11'.9 S
Alphard	217° 56'.0	8° 43'.3 S
Alphecca	126° 10'.8	26° 40'.1 N
Alpheratz	357° 44'.0	29° 09'.7 N
Altair	62° 08'.4	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.0 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.8	69° 02'.8 S
Avior	234° 17'.9	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.3	52° 42'.6 S
Capella	280° 34'.9	46° 00'.6 N
Deneb	49° 31'.7	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.9 S
Dubhe	193° 51'.3	61° 40'.7 N
Elnath	278° 12'.9	28° 37'.0 N
Eltanin	90° 46'.0	51° 29'.0 N
Enif	33° 47'.4	9° 56'.1 N
Fomalhaut	15° 24'.4	29° 33'.0 S
Gacrux	172° 00'.4	57° 11'.4 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.2 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.9	34° 22'.5 S
Kochab	137° 19'.0	74° 05'.9 N
Markab	13° 38'.7	15° 16'.5 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.2	69° 46'.7 S
Mirfak	308° 40'.9	49° 54'.5 N
Nunki	75° 58'.4	26° 16'.6 S
Peacock	53° 19'.6	56° 41'.2 S
Polaris	318° 15'.2	89° 19'.4 N
Pollux	243° 27'.9	27° 59'.5 N
Procyon	244° 59'.8	5° 11'.2 N
Rasalhague	96° 06'.4	12° 33'.0 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 12'.3	8° 11'.5 S
Rigil Kent	139° 51'.2	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.5 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.9	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.3	43° 29'.6 S
Vega	80° 39'.0	38° 47'.6 N
Zuben'ubi	137° 05'.3	16° 05'.9 S

	SHA	Mer.Pass.
Venus	340° 13'.3	12:14
Mars	340° 48'.9	12:11
Jupiter	288° 19'.7	15:39
Saturn	141° 50'.1	01:27

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
179° 27'.1	6° 48'.4 N	219° 17'.4	11'.7	4° 39'.2 S	11'.3	57'.6
194° 27'.3	49'.3	233° 48'.1	11'.8	27'.9	11'.4	
209° 27'.5	50'.3	248° 18'.9	11'.9	16'.5	11'.3	57'.5
224° 27'.6	51'.2	262° 49'.8	11'.9	05'.2	11'.4	
239° 27'.8	52'.2	277° 20'.7	11'.9	3° 53'.8 S	11'.4	
254° 28'.0	53'.1	291° 51'.6	11'.9	42'.4	11'.4	
269° 28'.2	54'.0	306° 22'.5	12'.0	31'.0	11'.4	
284° 28'.3	55'.0	320° 53'.5	12'.0	19'.6	11'.4	57'.4
299° 28'.5	55'.9	335° 24'.5	12'.0	08'.2	11'.5	
314° 28'.7	56'.9	349° 55'.5	12'.1	2° 56'.7 S	11'.4	
329° 28'.9	57'.8	4° 26'.6	12'.1	45'.3	11'.4	
344° 29'.0	58'.7	18° 57'.7	12'.1	33'.9	11'.5	
359° 29'.2	6° 59'.7 N	33° 28'.8	12'.2	2° 22'.4 S	11'.4	57'.3
14° 29'.4	7° 00'.6 N	48° 00'.0	12'.2	11'.0	11'.5	
29° 29'.5	01'.5	62° 31'.2	12'.2	1° 59'.5 S	11'.5	
44° 29'.7	02'.5	77° 02'.4	12'.2	48'.0	11'.4	
59° 29'.9	03'.4	91° 33'.6	12'.3	36'.6	11'.5	
74° 30'.1	04'.4	106° 04'.9	12'.3	25'.1	11'.5	57'.2
89° 30'.2	05'.3	120° 36'.2	12'.3	13'.6	11'.4	
104° 30'.4	06'.2	135° 07'.5	12'.3	02'.2	11'.5	
119° 30'.6	07'.2	149° 38'.8	12'.3	0° 50'.7 S	11'.4	
134° 30'.8	08'.1	164° 10'.1	12'.4	39'.3	11'.5	
149° 30'.9	09'.0	178° 41'.5	12'.4	27'.8	11'.4	57'.1
164° 31'.1	10'.0	193° 12'.9	12'.4	16'.4	11'.5	
179° 31'.3	7° 10'.9 N	207° 44'.3	12'.5	0° 04'.9 S	11'.4	57'.1
194° 31'.5	11'.8	222° 15'.8	12'.4	0° 06'.5 N	11'.4	
209° 31'.6	12'.8	236° 47'.2	12'.5	17'.9	11'.4	
224° 31'.8	13'.7	251° 18'.7	12'.5	29'.3	11'.5	57'.0
239° 32'.0	14'.6	265° 50'.2	12'.5	40'.8	11'.3	
254° 32'.1	15'.6	280° 21'.7	12'.5	52'.1	11'.4	
269° 32'.3	16'.5	294° 53'.2	12'.6	1° 03'.5 N	11'.4	
284° 32'.5	17'.5	309° 24'.8	12'.5	14'.9	11'.4	
299° 32'.7	18'.4	323° 56'.3	12'.6	26'.3	11'.3	56'.9
314° 32'.8	19'.3	338° 27'.9	12'.6	37'.6	11'.3	
329° 33'.0	20'.3	352° 59'.5	12'.6	48'.9	11'.3	
344° 33'.2	21'.2	7° 31'.1	12'.6	2° 00'.2 N	11'.3	
359° 33'.3	7° 22'.1 N	22° 02'.7	12'.7	2° 11'.5 N	11'.3	56'.9
14° 33'.5	23'.1	36° 34'.4	12'.6	22'.8	11'.3	56'.8
29° 33'.7	24'.0	51° 06'.0	12'.7	34'.1	11'.2	
44° 33'.9	24'.9	65° 37'.7	12'.6	45'.3	11'.2	
59° 34'.0	25'.8	80° 09'.3	12'.7	56'.5	11'.2	
74° 34'.2	26'.8	94° 41'.0	12'.7	3° 07'.7 N	11'.2	
89° 34'.4	27'.7	109° 12'.7	12'.7	18'.9	11'.1	56'.7
104° 34'.5	28'.6	123° 44'.4	12'.7	30'.0	11'.1	
119° 34'.7	29'.6	138° 16'.1	12'.7	41'.1	11'.1	
134° 34'.9	30'.5	152° 47'.8	12'.7	52'.2	11'.1	
149° 35'.1	31'.4	167° 19'.5	12'.8	4° 03'.3 N	11'.0	
164° 35'.2	32'.4	181° 51'.3	12'.7	14'.3	11'.1	56'.6
179° 35'.4	7° 33'.3 N	196° 23'.0	12'.7	4° 25'.4 N	10'.9	56'.6
194° 35'.6	34'.2	210° 54'.7	12'.8	36'.3	11'.0	
209° 35'.7	35'.2	225° 26'.5	12'.7	47'.3	10'.9	
224° 35'.9	36'.1	239° 58'.2	12'.8	58'.2	10'.9	56'.5
239° 36'.1	37'.0	254° 30'.0	12'.7	5° 09'.1 N	10'.9	
254° 36'.2	37'.9	269° 01'.7	12'.8	20'.0	10'.8	
269° 36'.4	38'.9	283° 33'.5	12'.8	30'.8	10'.8	
284° 36'.6	39'.8	298° 05'.3	12'.7	41'.6	10'.8	
299° 36'.7	40'.7	312° 37'.0	12'.8	52'.4	10'.7	56'.4
314° 36'.9	41'.7	327° 08'.8	12'.8	6° 03'.1 N	10'.7	
329° 37'.1	42'.6	341° 40'.6	12'.8	13'.8	10'.6	
344° 37'.3	43'.5	356° 12'.4	12'.7	24'.4	10'.6	
359° 37'.4	7° 44'.4 N	10° 44'.1	12'.8	6° 35'.0 N	10'.6	56'.4
14° 37'.6	45'.4	25° 15'.9	12'.8	45'.6	10'.5	56'.3
29° 37'.8	46'.3	39° 47'.7	12'.7	56'.1	10'.5	
44° 37'.9	47'.2	54° 19'.4	12'.8	7° 06'.6 N	10'.5	
59° 38'.1	48'.2	68° 51'.2	12'.8	17'.1	10'.4	
74° 38'.3	49'.1	83° 23'.0	12'.7	27'.5	10'.3	
89° 38'.4	50'.0	97° 54'.7	12'.8	37'.8	10'.4	56'.2
104° 38'.6	50'.9	112° 26'.5	12'.8	48'.2	10'.2	
119° 38'.8	51'.9	126° 58'.3	12'.7	58'.4	10'.3	
134° 38'.9	52'.8	141° 30'.0	12'.8	8° 08'.7 N	10'.2	
149° 39'.1	53'.7	156° 01'.8	12'.7	18'.9	10'.1	
164° 39'.3	54'.6	170° 33'.5	12'.8	29'.0	10'.1	56'.1
SD 16'.0	d 0'.9	SD	15'.6	15'.5	15'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9
N 72°	-	02:54	04:18	04:21	04:10	03:59
N 70°	01:07	03:18	04:29	04:15	04:11	04:06
68°	01:59	03:36	04:39	04:11	04:11	04:12
66°	02:29	03:50	04:47	04:07	04:12	04:17
64°	02:52	04:02	04:53	04:04	04:12	04:21
62°	03:09	04:11	04:59	04:01	04:13	04:24
60°	03:23	04:20	05:04	03:59	04:13	04:27
N 58°	03:35	04:27	05:08	03:57	04:13	04:30
56°	03:45	04:33	05:12	03:55	04:14	04:33
54°	03:53	04:39	05:16	03:53	04:14	04:35
52°	04:01	04:44	05:19	03:51	04:14	04:37
50°	04:08	04:48	05:22	03:50	04:14	04:39
45°	04:22	04:58	05:28	03:47	04:15	04:43
N 40°	04:32	05:05	05:33	03:44	04:15	04:46
35°	04:41	05:12	05:37	03:42	04:16	04:49
30°	04:48	05:17	05:41	03:40	04:16	04:52
20°	04:59	05:25	05:48	03:36	04:17	04:57
N 10°	05:07	05:32	05:53	03:33	04:17	05:01
0°	05:13	05:38	05:58	03:30	04:18	05:05
S 10°	05:18	05:42	06:04	03:27	04:18	05:08
20°	05:21	05:47	06:09	03:24	04:19	05:13
30°	05:23	05:51	06:15	03:21	04:20	05:17
35°	05:23	05:53	06:18	03:19	04:20	05:20
40°	05:23	05:55	06:22	03:16	04:20	05:23
45°	05:23	05:57	06:26	03:14	04:21	05:27
S 50°	05:22	05:59	06:32	03:10	04:22	05:32
52°	05:21	06:00	06:34	03:09	04:22	05:34
54°	05:20	06:01	06:37	03:07	04:22	05:36
56°	05:19	06:02	06:39	03:06	04:23	05:38
58°	05:18	06:03	06:43	03:04	04:23	05:41
S 60°	05:16	06:04	06:46	03:01	04:24	05:44
S 62°	05:14	06:05	06:50	02:59	04:24	05:48

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 7	Moonset 8	Moonset 9
N 72°	19:49	21:15	-	15:30	17:20	19:09
N 70°	19:37	20:50	23:12	15:33	17:15	18:57
68°	19:27	20:31	22:12	15:35	17:12	18:47
66°	19:19	20:16	21:39	15:37	17:09	18:40
64°	19:12	20:04	21:16	15:38	17:06	18:33
62°	19:06	19:54	20:58	15:39	17:04	18:27
60°	19:01	19:46	20:43	15:41	17:02	18:22
N 58°	18:57	19:38	20:31	15:42	17:00	18:18
56°	18:53	19:32	20:21	15:42	16:59	18:14
54°	18:49	19:26	20:12	15:43	16:58	18:11
52°	18:46	19:21	20:04	15:44	16:56	18:07
50°	18:43	19:16	19:57	15:45	16:55	18:05
45°	18:37	19:07	19:43	15:46	16:53	17:58
N 40°	18:31	18:59	19:32	15:47	16:51	17:53
35°	18:27	18:53	19:23	15:48	16:49	17:49
30°	18:23	18:47	19:16	15:49	16:47	17:45
20°	18:16	18:39	19:05	15:51	16:45	17:38
N 10°	18:10	18:32	18:56	15:52	16:42	17:32
0°	18:05	18:26	18:50	15:53	16:40	17:27
S 10°	18:00	18:21	18:45	15:54	16:38	17:21
20°	17:54	18:17	18:42	15:55	16:36	17:15
30°	17:48	18:12	18:40	15:57	16:33	17:09
35°	17:45	18:10	18:39	15:58	16:31	17:05
40°	17:41	18:08	18:39	15:58	16:29	17:01
45°	17:36	18:06	18:40	15:59	16:27	16:56
S 50°	17:31	18:04	18:41	16:01	16:25	16:50
52°	17:29	18:03	18:41	16:01	16:24	16:47
54°	17:26	18:02	18:42	16:02	16:23	16:44
56°	17:23	18:00	18:43	16:02	16:21	16:41
58°	17:20	17:59	18:45	16:03	16:20	16:37
S 60°	17:16	17:58	18:46	16:04	16:18	16:33
S 62°	17:12	17:57	18:48	16:05	16:16	16:28

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON ● Age/ Vis
7	2 12	2 04	12:02	09:42	22:05	27d 9%
8	1 55	1 47	12:02	10:29	22:52	28d 4%
9	1 39	1 31	12:02	11:16	23:39	29d 1%

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2013 April 10, 11, 12 (Wed, Thur, Fri)

GMT		ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.1		SATURN +0.2	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
10 Wednesday	00	198° 23'.4	176° 18'.5	8° 05'.7 N	177° 47'.4	8° 09'.2 N	126° 20'.2	22° 02'.4 N	340° 21'.4	12° 08'.3 S
	01	213° 25'.8	191° 18'.1	06'.9	192° 48'.1	09'.9	141° 22'.1	02'.5	355° 24'.0	08'.2
	02	228° 28'.3	206° 17'.6	08'.1	207° 48'.8	10'.7	156° 24'.1	02'.5	10° 26'.6	08'.2
	03	243° 30'.8	221° 17'.2	09'.3	222° 49'.4	11'.4	171° 26'.1	02'.6	25° 29'.3	08'.1
	04	258° 33'.2	236° 16'.8	10'.5	237° 50'.1	12'.1	186° 28'.1	02'.7	40° 31'.9	08'.1
	05	273° 35'.7	251° 16'.4	11'.7	252° 50'.8	12'.9	201° 30'.1	02'.7	55° 34'.5	08'.0
	06	288° 38'.1	266° 16'.0	12'.9	267° 51'.5	13'.6	216° 32'.0	02'.8	70° 37'.2	08'.0
	07	303° 40'.6	281° 15'.5	14'.1	282° 52'.2	14'.3	231° 34'.0	02'.9	85° 39'.8	07'.9
	08	318° 43'.1	296° 15'.1	15'.3	297° 52'.9	15'.0	246° 36'.0	02'.9	100° 42'.4	07'.8
	09	333° 45'.5	311° 14'.7	16'.5	312° 53'.6	15'.8	261° 38'.0	03'.0	115° 45'.1	07'.8
	10	348° 48'.0	326° 14'.3	17'.7	327° 54'.3	16'.5	276° 40'.0	03'.0	130° 47'.7	07'.7
	11	3° 50'.5	341° 13'.8	18'.9	342° 55'.0	17'.2	291° 42'.0	03'.1	145° 50'.3	07'.7
	12	18° 52'.9	356° 13'.4	8° 20'.1 N	357° 55'.7	8° 18'.0 N	306° 43'.9	22° 03'.2 N	160° 53'.0	12° 07'.6 S
	13	33° 55'.4	11° 13'.0	21'.3	12° 56'.4	18'.7	321° 45'.9	03'.2	175° 55'.6	07'.6
	14	48° 57'.9	26° 12'.6	22'.5	27° 57'.1	19'.4	336° 47'.9	03'.3	190° 58'.2	07'.5
	15	64° 00'.3	41° 12'.1	23'.7	42° 57'.8	20'.1	351° 49'.9	03'.3	206° 00'.9	07'.4
	16	79° 02'.8	56° 11'.7	24'.9	57° 58'.5	20'.9	6° 51'.9	03'.4	221° 03'.5	07'.4
	17	94° 05'.3	71° 11'.3	26'.1	72° 59'.2	21'.6	21° 53'.8	03'.5	236° 06'.1	07'.3
	18	109° 07'.7	86° 10'.9	27'.3	87° 59'.9	22'.3	36° 55'.8	03'.5	251° 08'.8	07'.3
	19	124° 10'.2	101° 10'.4	28'.5	103° 00'.6	23'.1	51° 57'.8	03'.6	266° 11'.4	07'.2
	20	139° 12'.6	116° 10'.0	29'.7	118° 01'.3	23'.8	66° 59'.8	03'.6	281° 14'.0	07'.2
	21	154° 15'.1	131° 09'.6	30'.9	133° 02'.0	24'.5	82° 01'.7	03'.7	296° 16'.7	07'.1
	22	169° 17'.6	146° 09'.2	32'.1	148° 02'.7	25'.2	97° 03'.7	03'.8	311° 19'.3	07'.0
	23	184° 20'.0	161° 08'.7	33'.3	163° 03'.3	26'.0	112° 05'.7	03'.8	326° 21'.9	07'.0
11 Thursday	00	199° 22'.5	176° 08'.3	8° 34'.5 N	178° 04'.0	8° 26'.7 N	127° 07'.7	22° 03'.9 N	341° 24'.6	12° 06'.9 S
	01	214° 25'.0	191° 07'.9	35'.7	193° 04'.7	27'.4	142° 09'.7	04'.0	356° 27'.2	06'.9
	02	229° 27'.4	206° 07'.5	36'.9	208° 05'.4	28'.1	157° 11'.6	04'.0	11° 29'.8	06'.8
	03	244° 29'.9	221° 07'.0	38'.1	223° 06'.1	28'.9	172° 13'.6	04'.1	26° 32'.5	06'.7
	04	259° 32'.4	236° 06'.6	39'.3	238° 06'.8	29'.6	187° 15'.6	04'.1	41° 35'.1	06'.7
	05	274° 34'.8	251° 06'.2	40'.4	253° 07'.5	30'.3	202° 17'.6	04'.2	56° 37'.7	06'.6
	06	289° 37'.3	266° 05'.8	41'.6	268° 08'.2	31'.0	217° 19'.5	04'.3	71° 40'.3	06'.6
	07	304° 39'.7	281° 05'.3	42'.8	283° 08'.9	31'.8	232° 21'.5	04'.3	86° 43'.0	06'.5
	08	319° 42'.2	296° 04'.9	44'.0	298° 09'.6	32'.5	247° 23'.5	04'.4	101° 45'.6	06'.5
	09	334° 44'.7	311° 04'.5	45'.2	313° 10'.3	33'.2	262° 25'.5	04'.4	116° 48'.3	06'.4
	10	349° 47'.1	326° 04'.0	46'.4	328° 11'.0	33'.9	277° 27'.5	04'.5	131° 50'.9	06'.3
	11	4° 49'.6	341° 03'.6	47'.6	343° 11'.7	34'.7	292° 29'.4	04'.6	146° 53'.5	06'.3
	12	19° 52'.1	356° 03'.2	8° 48'.8 N	358° 12'.4	8° 35'.4 N	307° 31'.4	22° 04'.6 N	161° 56'.2	12° 06'.2 S
	13	34° 54'.5	11° 02'.8	50'.0	13° 13'.1	36'.1	322° 33'.4	04'.7	176° 58'.8	06'.2
	14	49° 57'.0	26° 02'.3	51'.2	28° 13'.8	36'.8	337° 35'.4	04'.8	192° 01'.4	06'.1
	15	64° 59'.5	41° 01'.9	52'.4	43° 14'.5	37'.5	352° 37'.3	04'.8	207° 04'.1	06'.0
	16	80° 01'.9	56° 01'.5	53'.5	58° 15'.1	38'.3	7° 39'.3	04'.9	222° 06'.7	06'.0
	17	95° 04'.4	71° 01'.0	54'.7	73° 15'.8	39'.0	22° 41'.3	04'.9	237° 09'.3	05'.9
	18	110° 06'.9	86° 00'.6	55'.9	88° 16'.5	39'.7	37° 43'.3	05'.0	252° 12'.0	05'.9
	19	125° 09'.3	101° 00'.2	57'.1	103° 17'.2	40'.4	52° 45'.2	05'.1	267° 14'.6	05'.8
	20	140° 11'.8	115° 59'.7	58'.3	118° 17'.9	41'.2	67° 47'.2	05'.1	282° 17'.2	05'.8
	21	155° 14'.2	130° 59'.3	59'.5	133° 18'.6	41'.9	82° 49'.2	05'.2	297° 19'.9	05'.7
	22	170° 16'.7	145° 58'.9	9° 00'.7 N	148° 19'.3	42'.6	97° 51'.2	05'.2	312° 22'.5	05'.6
	23	185° 19'.2	160° 58'.4	01'.9	163° 20'.0	43'.3	112° 53'.1	05'.3	327° 25'.1	05'.6
12 Friday	00	200° 21'.6	175° 58'.0	9° 03'.0 N	178° 20'.7	8° 44'.0 N	127° 55'.1	22° 05'.4 N	342° 27'.8	12° 05'.5 S
	01	215° 24'.1	190° 57'.6	04'.2	193° 21'.4	44'.8	142° 57'.1	05'.4	357° 30'.4	05'.5
	02	230° 26'.6	205° 57'.1	05'.4	208° 22'.1	45'.5	157° 59'.1	05'.5	12° 33'.0	05'.4
	03	245° 29'.0	220° 56'.7	06'.6	223° 22'.8	46'.2	173° 01'.0	05'.5	27° 35'.7	05'.3
	04	260° 31'.5	235° 56'.3	07'.8	238° 23'.5	46'.9	188° 03'.0	05'.6	42° 38'.3	05'.3
	05	275° 34'.0	250° 55'.8	09'.0	253° 24'.2	47'.7	203° 05'.0	05'.7	57° 40'.9	05'.2
	06	290° 36'.4	265° 55'.4	10'.2	268° 24'.9	48'.4	218° 06'.9	05'.7	72° 43'.6	05'.2
	07	305° 38'.9	280° 55'.0	11'.3	283° 25'.6	49'.1	233° 08'.9	05'.8	87° 46'.2	05'.1
	08	320° 41'.3	295° 54'.5	12'.5	298° 26'.2	49'.8	248° 10'.9	05'.9	102° 48'.8	05'.1
	09	335° 43'.8	310° 54'.1	13'.7	313° 26'.9	50'.5	263° 12'.9	05'.9	117° 51'.5	05'.0
	10	350° 46'.3	325° 53'.7	14'.9	328° 27'.6	51'.3	278° 14'.8	06'.0	132° 54'.1	04'.9
	11	5° 48'.7	340° 53'.2	16'.1	343° 28'.3	52'.0	293° 16'.8	06'.0	147° 56'.7	04'.9
	12	20° 51'.2	355° 52'.8	9° 17'.3 N	358° 29'.0	8° 52'.7 N	308° 18'.8	22° 06'.1 N	162° 59'.4	12° 04'.8 S
	13	35° 53'.7	10° 52'.4	18'.4	13° 29'.7	53'.4	323° 20'.8	06'.2	178° 02'.0	04'.8
	14	50° 56'.1	25° 51'.9	19'.6	28° 30'.4	54'.1	338° 22'.7	06'.2	193° 04'.7	04'.7
	15	65° 58'.6	40° 51'.5	20'.8	43° 31'.1	54'.9	353° 24'.7	06'.3	208° 07'.3	04'.6
	16	81° 01'.1	55° 51'.0	22'.0	58° 31'.8	55'.6	8° 26'.7	06'.3	223° 09'.9	04'.6
	17	96° 03'.5	70° 50'.6	23'.2	73° 32'.5	56'.3	23° 28'.6	06'.4	238° 12'.6	04'.5
	18	111° 06'.0	85° 50'.2	24'.3	88° 33'.2	57'.0	38° 30'.6	06'.5	253° 15'.2	04'.5
	19	126° 08'.5	100° 49'.7	25'.5	103° 33'.9	57'.7	53° 32'.6	06'.5	268° 17'.8	04'.4
	20	141° 10'.9	115° 49'.3	26'.7	118° 34'.6	58'.4	68° 34'.5	06'.6	283° 20'.5	04'.4
	21	156° 13'.4	130° 48'.9	27'.9	133° 35'.3	59'.2	83° 36'.5	06'.6	298° 23'.1	04'.3
	22	171° 15'.8	145° 48'.4	29'.0	148° 36'.0	59'.9	98° 38'.5	06'.7	313° 25'.7	04'.2
	23	186° 18'.3	160° 48'.0	30'.2	163° 36'.6	9° 00'.6 N	113° 40'.5	06'.8	328° 28'.4	04'.2
		M.P. 10:37	v -0'.4	d 1'.2	v 0'.7	d 0'.7	v 2'.0	d 0'.1	v 2'.6	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.3 S
Achernar	335° 27'.5	57° 10'.2 S
Acrux	173° 08'.7	63° 10'.6 S
Adhara	255° 12'.7	28° 59'.8 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.2 N
Alkaid	152° 58'.5	49° 14'.7 N
Alnair	27° 44'.2	46° 53'.6 S
Alnilam	275° 46'.6	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.8	26° 40'.1 N
Alpheratz	357° 44'.0	29° 09'.7 N
Altair	62° 08'.4	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.0 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.8	69° 02'.8 S
Avior	234° 17'.9	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.4	52° 42'.6 S
Capella	280° 34'.9	46° 00'.6 N
Deneb	49° 31'.7	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.9 S
Dubhe	193° 51'.4	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 46'.0	51° 29'.1 N
Enif	33° 47'.4	9° 56'.1 N
Fomalhaut	15° 24'.4	29° 33'.0 S
Gacrux	172° 00'.4	57° 11'.4 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.2 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.9	34° 22'.5 S
Kochab	137° 19'.0	74° 05'.9 N
Markab	13° 38'.7	15° 16'.5 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.3	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.5 N
Nunki	75° 58'.4	26° 16'.6 S
Peacock	53° 19'.6	56° 41'.2 S
Polaris	318° 15'.6	89° 19'.3 N
Pollux	243° 27'.9	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.4	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.5 S
Rigil Kent	139° 51'.2	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.5 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.9	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.3	43° 29'.6 S
Vega	80° 38'.9	38° 47'.6 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	336° 45'.8	12:16
Mars	338° 41'.5	12:07
Jupiter	287° 45'.2	15:29
Saturn	142° 02'.1	01:14

SUN				MOON				
GHA	Dec			GHA	v	Dec	d	HP
179° 39'.4	7° 55'.6 N			185° 05'.3	12'.7	8° 39'.1 N	10'.0	56'.1
194° 39'.6	56'.5			199° 37'.0	12'.8	49'.1	10'.0	
209° 39'.8	57'.4			214° 08'.8	12'.7	59'.1	10'.0	
224° 39'.9	58'.3			228° 40'.5	12'.7	9° 09'.1 N	9'.9	56'.0
239° 40'.1	59'.3			243° 12'.2	12'.7	19'.0	9'.8	
254° 40'.3	8° 00'.2 N			257° 43'.9	12'.7	28'.8	9'.8	
269° 40'.4	01'.1			272° 15'.6	12'.7	38'.6	9'.7	
284° 40'.6	02'.0			286° 47'.3	12'.7	48'.3	9'.7	
299° 40'.8	03'.0			301° 19'.0	12'.7	58'.0	9'.6	55'.9
314° 40'.9	03'.9			315° 50'.7	12'.7	10° 07'.6 N	9'.6	
329° 41'.1	04'.8			330° 22'.4	12'.7	17'.2	9'.5	
344° 41'.3	05'.7			344° 54'.1	12'.6	26'.7	9'.5	
359° 41'.4	8° 06'.6 N			359° 25'.7	12'.7	10° 36'.2 N	9'.4	55'.9
14° 41'.6	07'.6			13° 57'.4	12'.6	45'.6	9'.3	55'.8
29° 41'.8	08'.5			28° 29'.0	12'.7	54'.9	9'.3	
44° 41'.9	09'.4			43° 00'.7	12'.6	11° 04'.2 N	9'.3	
59° 42'.1	10'.3			57° 32'.3	12'.6	13'.5	9'.1	
74° 42'.3	11'.2			72° 03'.9	12'.6	22'.6	9'.1	
89° 42'.4	12'.2			86° 35'.5	12'.6	31'.7	9'.1	55'.7
104° 42'.6	13'.1			101° 07'.1	12'.6	40'.8	9'.0	
119° 42'.8	14'.0			115° 38'.7	12'.6	49'.8	8'.9	
134° 42'.9	14'.9			130° 10'.3	12'.5	58'.7	8'.8	
149° 43'.1	15'.8			144° 41'.8	12'.6	12° 07'.5 N	8'.8	
164° 43'.3	16'.8			159° 13'.4	12'.5	16'.3	8'.8	55'.6
179° 43'.4	8° 17'.7 N			173° 44'.9	12'.6	12° 25'.1 N	8'.6	55'.6
194° 43'.6	18'.6			188° 16'.5	12'.5	33'.7	8'.6	
209° 43'.7	19'.5			202° 48'.0	12'.5	42'.3	8'.6	
224° 43'.9	20'.4			217° 19'.5	12'.5	50'.9	8'.4	
239° 44'.1	21'.4			231° 51'.0	12'.5	59'.3	8'.4	55'.5
254° 44'.2	22'.3			246° 22'.5	12'.4	13° 07'.7 N	8'.4	
269° 44'.4	23'.2			260° 53'.9	12'.5	16'.1	8'.2	
284° 44'.6	24'.1			275° 25'.4	12'.4	24'.3	8'.2	
299° 44'.7	25'.0			289° 56'.8	12'.5	32'.5	8'.1	
314° 44'.9	26'.0			304° 28'.3	12'.4	40'.6	8'.1	55'.4
329° 45'.1	26'.9			318° 59'.7	12'.4	48'.7	8'.0	
344° 45'.2	27'.8			333° 31'.1	12'.4	56'.7	7'.9	
359° 45'.4	8° 28'.7 N			348° 02'.5	12'.4	14° 04'.6 N	7'.8	55'.4
14° 45'.5	29'.6			2° 33'.9	12'.3	12'.4	7'.8	
29° 45'.7	30'.5			17° 05'.2	12'.4	20'.2	7'.7	55'.3
44° 45'.9	31'.4			31° 36'.6	12'.3	27'.9	7'.6	
59° 46'.0	32'.4			46° 07'.9	12'.4	35'.5	7'.5	
74° 46'.2	33'.3			60° 39'.3	12'.3	43'.0	7'.5	
89° 46'.4	34'.2			75° 10'.6	12'.3	50'.5	7'.4	
104° 46'.5	35'.1			89° 41'.9	12'.3	57'.9	7'.3	55'.2
119° 46'.7	36'.0			104° 13'.2	12'.2	15° 05'.2 N	7'.3	
134° 46'.8	36'.9			118° 44'.4	12'.3	12'.5	7'.1	
149° 47'.0	37'.9			133° 15'.7	12'.3	19'.6	7'.1	
164° 47'.2	38'.8			147° 47'.0	12'.2	26'.7	7'.0	
179° 47'.3	8° 39'.7 N			162° 18'.2	12'.2	15° 33'.7 N	6'.9	55'.2
194° 47'.5	40'.6			176° 49'.4	12'.2	40'.6	6'.9	55'.1
209° 47'.6	41'.5			191° 20'.6	12'.2	47'.5	6'.8	
224° 47'.8	42'.4			205° 51'.8	12'.2	54'.3	6'.6	
239° 48'.0	43'.3			220° 23'.0	12'.2	16° 00'.9 N	6'.7	
254° 48'.1	44'.2			234° 54'.2	12'.1	07'.6	6'.5	
269° 48'.3	45'.2			249° 25'.3	12'.2	14'.1	6'.4	55'.0
284° 48'.4	46'.1			263° 56'.5	12'.1	20'.5	6'.4	
299° 48'.6	47'.0			278° 27'.6	12'.2	26'.9	6'.3	
314° 48'.8	47'.9			292° 58'.8	12'.1	33'.2	6'.2	
329° 48'.9	48'.8			307° 29'.9	12'.1	39'.4	6'.1	
344° 49'.1	49'.7			322° 01'.0	12'.0	45'.5	6'.0	
359° 49'.2	8° 50'.6 N			336° 32'.0	12'.1	16° 51'.5 N	6'.0	54'.9
14° 49'.4	51'.5			351° 03'.1	12'.1	57'.5	5'.9	
29° 49'.6	52'.4			5° 34'.2	12'.0	17° 03'.4 N	5'.7	
44° 49'.7	53'.3			20° 05'.2	12'.1	09'.1	5'.7	
59° 49'.9	54'.3			34° 36'.3	12'.0	14'.8	5'.6	
74° 50'.0	55'.2			49° 07'.3	12'.0	20'.4	5'.6	
89° 50'.2	56'.1			63° 38'.3	12'.0	26'.0	5'.4	54'.8
104° 50'.4	57'.0			78° 09'.3	12'.0	31'.4	5'.4	
119° 50'.5	57'.9			92° 40'.3	12'.0	36'.8	5'.2	
134° 50'.7	58'.8			107° 11'.3	12'.0	42'.0	5'.2	
149° 50'.8	59'.7			121° 42'.3	12'.0	47'.2	5'.1	
164° 51'.0	9° 00'.6 N			136° 13'.3	11'.9	52'.3	5'.0	
SD 16'.0	d 0'.9			SD	15'.2	15'.1	15'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12
N 72°	-	02:31	04:01	03:48	03:34	03:14
N 70°	-	03:00	04:15	04:02	03:57	03:52
68°	01:32	03:20	04:26	04:13	04:15	04:19
66°	02:10	03:37	04:35	04:22	04:29	04:40
64°	02:36	03:50	04:43	04:30	04:41	04:56
62°	02:56	04:01	04:49	04:37	04:51	05:10
60°	03:11	04:10	04:55	04:43	05:00	05:22
N 58°	03:24	04:18	05:00	04:48	05:08	05:32
56°	03:35	04:25	05:04	04:52	05:15	05:40
54°	03:45	04:31	05:08	04:57	05:21	05:48
52°	03:53	04:37	05:12	05:00	05:26	05:55
50°	04:01	04:42	05:15	05:04	05:31	06:02
45°	04:16	04:52	05:22	05:12	05:42	06:16
N 40°	04:27	05:00	05:28	05:18	05:51	06:27
35°	04:37	05:07	05:33	05:23	05:59	06:37
30°	04:45	05:13	05:38	05:28	06:06	06:45
20°	04:57	05:23	05:45	05:37	06:18	07:00
N 10°	05:06	05:30	05:52	05:44	06:28	07:13
0°	05:13	05:37	05:58	05:51	06:38	07:25
S 10°	05:18	05:42	06:04	05:58	06:48	07:38
20°	05:22	05:48	06:10	06:06	06:59	07:51
30°	05:25	05:53	06:17	06:15	07:11	08:06
35°	05:26	05:55	06:21	06:20	07:18	08:15
40°	05:26	05:58	06:25	06:25	07:26	08:25
45°	05:27	06:01	06:30	06:32	07:36	08:37
S 50°	05:26	06:04	06:36	06:40	07:47	08:51
52°	05:26	06:05	06:39	06:44	07:52	08:58
54°	05:25	06:06	06:42	06:48	07:58	09:06
56°	05:25	06:08	06:45	06:53	08:05	09:14
58°	05:24	06:09	06:49	06:58	08:12	09:24
S 60°	05:23	06:11	06:53	07:04	08:21	09:35
S 62°	05:22	06:13	06:58	07:10	08:31	09:47

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 10	Moonset 11	Moonset 12
N 72°	20:04	21:37	-	21:01	22:59	-
N 70°	19:50	21:07	-	20:39	22:22	24:07
68°	19:39	20:45	22:39	20:22	21:56	23:27
66°	19:29	20:28	21:57	20:09	21:36	22:59
64°	19:21	20:15	21:30	19:58	21:20	22:38
62°	19:14	20:03	21:09	19:49	21:07	22:22
60°	19:09	19:54	20:53	19:41	20:56	22:08
N 58°	19:03	19:46	20:40	19:34	20:47	21:56
56°	18:59	19:39	20:28	19:27	20:38	21:45
54°	18:55	19:32	20:19	19:22	20:31	21:36
52°	18:51	19:27	20:10	19:17	20:24	21:28
50°	18:48	19:22	20:03	19:12	20:18	21:21
45°	18:40	19:11	19:48	19:03	20:05	21:05
N 40°	18:34	19:02	19:36	18:55	19:55	20:53
35°	18:29	18:55	19:26	18:48	19:46	20:42
30°	18:25	18:49	19:18	18:42	19:38	20:32
20°	18:17	18:39	19:06	18:31	19:24	20:16
N 10°	18:10	18:32	18:56	18:22	19:12	20:02
0°	18:04	18:25	18:49	18:14	19:01	19:49
S 10°	17:58	18:19	18:44	18:05	18:50	19:35
20°	17:52	18:14	18:40	17:56	18:38	19:21
30°	17:45	18:09	18:37	17:46	18:24	19:05
35°	17:41	18:06	18:36	17:40	18:16	18:56
40°	17:36	18:04	18:35	17:33	18:08	18:45
45°	17:31	18:01	18:35	17:25	17:57	18:32
S 50°	17:25	17:57	18:35	17:16	17:45	18:17
52°	17:22	17:56	18:35	17:11	17:39	18:10
54°	17:19	17:55	18:35	17:07	17:32	18:02
56°	17:16	17:53	18:36	17:01	17:25	17:53
58°	17:12	17:51	18:37	16:56	17:17	17:44
S 60°	17:07	17:50	18:38	16:49	17:08	17:32
S 62°	17:03	17:48	18:39	16:42	16:58	17:19

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
10	1 23	1 15	12:01	12:02	24:26	0d 0%
11	1 07	0 59	12:01	12:49	00:26	1d 1%
12	0 51	0 43	12:01	13:37	01:13	2d 4%

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2013 April 13, 14, 15 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.0		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
13 Saturday 00	201° 20'.8	175° 47'.5	9° 31'.4 N	178° 37'.3	9° 01'.3 N	128° 42'.4	22° 06'.8 N	343° 31'.0	12° 04'.1 S
01	216° 23'.2	190° 47'.1	32'.6	193° 38'.0	02'.0	143° 44'.4	06'.9	358° 33'.6	04'.1
02	231° 25'.7	205° 46'.7	33'.8	208° 38'.7	02'.8	158° 46'.4	06'.9	13° 36'.3	04'.0
03	246° 28'.2	220° 46'.2	34'.9	223° 39'.4	03'.5	173° 48'.3	07'.0	28° 38'.9	03'.9
04	261° 30'.6	235° 45'.8	36'.1	238° 40'.1	04'.2	188° 50'.3	07'.1	43° 41'.6	03'.9
05	276° 33'.1	250° 45'.3	37'.3	253° 40'.8	04'.9	203° 52'.3	07'.1	58° 44'.2	03'.8
06	291° 35'.6	265° 44'.9	38'.5	268° 41'.5	05'.6	218° 54'.2	07'.2	73° 46'.8	03'.8
07	306° 38'.0	280° 44'.5	39'.6	283° 42'.2	06'.3	233° 56'.2	07'.3	88° 49'.5	03'.7
08	321° 40'.5	295° 44'.0	40'.8	298° 42'.9	07'.1	248° 58'.2	07'.3	103° 52'.1	03'.7
09	336° 43'.0	310° 43'.6	42'.0	313° 43'.6	07'.8	264° 00'.1	07'.4	118° 54'.7	03'.6
10	351° 45'.4	325° 43'.1	43'.2	328° 44'.3	08'.5	279° 02'.1	07'.4	133° 57'.4	03'.5
11	6° 47'.9	340° 42'.7	44'.3	343° 45'.0	09'.2	294° 04'.1	07'.5	149° 00'.0	03'.5
12	21° 50'.3	355° 42'.2	9° 45'.5 N	358° 45'.6	9° 09'.9 N	309° 06'.1	22° 07'.6 N	164° 02'.6	12° 03'.4 S
13	36° 52'.8	10° 41'.8	46'.7	13° 46'.3	10'.6	324° 08'.0	07'.6	179° 05'.3	03'.4
14	51° 55'.3	25° 41'.4	47'.8	28° 47'.0	11'.3	339° 10'.0	07'.7	194° 07'.9	03'.3
15	66° 57'.7	40° 40'.9	49'.0	43° 47'.7	12'.1	354° 12'.0	07'.7	209° 10'.6	03'.2
16	82° 00'.2	55° 40'.5	50'.2	58° 48'.4	12'.8	9° 13'.9	07'.8	224° 13'.2	03'.2
17	97° 02'.7	70° 40'.0	51'.4	73° 49'.1	13'.5	24° 15'.9	07'.9	239° 15'.8	03'.1
18	112° 05'.1	85° 39'.6	52'.5	88° 49'.8	14'.2	39° 17'.9	07'.9	254° 18'.5	03'.1
19	127° 07'.6	100° 39'.1	53'.7	103° 50'.5	14'.9	54° 19'.8	08'.0	269° 21'.1	03'.0
20	142° 10'.1	115° 38'.7	54'.9	118° 51'.2	15'.6	69° 21'.8	08'.0	284° 23'.7	02'.9
21	157° 12'.5	130° 38'.2	56'.0	133° 51'.9	16'.3	84° 23'.8	08'.1	299° 26'.4	02'.9
22	172° 15'.0	145° 37'.8	57'.2	148° 52'.6	17'.1	99° 25'.7	08'.2	314° 29'.0	02'.8
23	187° 17'.4	160° 37'.4	58'.4	163° 53'.3	17'.8	114° 27'.7	08'.2	329° 31'.7	02'.8
14 Sunday 00	202° 19'.9	175° 36'.9	9° 59'.5 N	178° 53'.9	9° 18'.5 N	129° 29'.7	22° 08'.3 N	344° 34'.3	12° 02'.7 S
01	217° 22'.4	190° 36'.5	10° 00'.7 N	193° 54'.6	19'.2	144° 31'.6	08'.3	359° 36'.9	02'.6
02	232° 24'.8	205° 36'.0	01'.9	208° 55'.3	19'.9	159° 33'.6	08'.4	14° 39'.6	02'.6
03	247° 27'.3	220° 35'.6	03'.0	223° 56'.0	20'.6	174° 35'.5	08'.5	29° 42'.2	02'.5
04	262° 29'.8	235° 35'.1	04'.2	238° 56'.7	21'.3	189° 37'.5	08'.5	44° 44'.8	02'.5
05	277° 32'.2	250° 34'.7	05'.4	253° 57'.4	22'.0	204° 39'.5	08'.6	59° 47'.5	02'.4
06	292° 34'.7	265° 34'.2	06'.5	268° 58'.1	22'.8	219° 41'.4	08'.6	74° 50'.1	02'.4
07	307° 37'.2	280° 33'.8	07'.7	283° 58'.8	23'.5	234° 43'.4	08'.7	89° 52'.8	02'.3
08	322° 39'.6	295° 33'.3	08'.9	298° 59'.5	24'.2	249° 45'.4	08'.8	104° 55'.4	02'.2
09	337° 42'.1	310° 32'.9	10'.0	314° 00'.2	24'.9	264° 47'.3	08'.8	119° 58'.0	02'.2
10	352° 44'.6	325° 32'.4	11'.2	329° 00'.9	25'.6	279° 49'.3	08'.9	135° 00'.7	02'.1
11	7° 47'.0	340° 32'.0	12'.4	344° 01'.6	26'.3	294° 51'.3	09'.0	150° 03'.3	02'.1
12	22° 49'.5	355° 31'.5	10° 13'.5 N	359° 02'.2	9° 27'.0 N	309° 53'.2	22° 09'.0 N	165° 05'.9	12° 02'.0 S
13	37° 51'.9	10° 31'.1	14'.7	14° 02'.9	27'.7	324° 55'.2	09'.1	180° 08'.6	01'.9
14	52° 54'.4	25° 30'.6	15'.8	29° 03'.6	28'.5	339° 57'.2	09'.1	195° 11'.2	01'.9
15	67° 56'.9	40° 30'.2	17'.0	44° 04'.3	29'.2	354° 59'.1	09'.2	210° 13'.9	01'.8
16	82° 59'.3	55° 29'.7	18'.2	59° 05'.0	29'.9	10° 01'.1	09'.3	225° 16'.5	01'.8
17	98° 01'.8	70° 29'.3	19'.3	74° 05'.7	30'.6	25° 03'.0	09'.3	240° 19'.1	01'.7
18	113° 04'.3	85° 28'.8	20'.5	89° 06'.4	31'.3	40° 05'.0	09'.4	255° 21'.8	01'.6
19	128° 06'.7	100° 28'.4	21'.6	104° 07'.1	32'.0	55° 07'.0	09'.4	270° 24'.4	01'.6
20	143° 09'.2	115° 27'.9	22'.8	119° 07'.8	32'.7	70° 08'.9	09'.5	285° 27'.1	01'.5
21	158° 11'.7	130° 27'.5	24'.0	134° 08'.5	33'.4	85° 10'.9	09'.6	300° 29'.7	01'.5
22	173° 14'.1	145° 27'.0	25'.1	149° 09'.2	34'.1	100° 12'.9	09'.6	315° 32'.3	01'.4
23	188° 16'.6	160° 26'.5	26'.3	164° 09'.8	34'.8	115° 14'.8	09'.7	330° 35'.0	01'.4
15 Monday 00	203° 19'.1	175° 26'.1	10° 27'.4 N	179° 10'.5	9° 35'.5 N	130° 16'.8	22° 09'.7 N	345° 37'.6	12° 01'.3 S
01	218° 21'.5	190° 25'.6	28'.6	194° 11'.2	36'.3	145° 18'.7	09'.8	0° 40'.3	01'.2
02	233° 24'.0	205° 25'.2	29'.8	209° 11'.9	37'.0	160° 20'.7	09'.9	15° 42'.9	01'.2
03	248° 26'.4	220° 24'.7	30'.9	224° 12'.6	37'.7	175° 22'.7	09'.9	30° 45'.5	01'.1
04	263° 28'.9	235° 24'.3	32'.1	239° 13'.3	38'.4	190° 24'.6	10'.0	45° 48'.2	01'.1
05	278° 31'.4	250° 23'.8	33'.2	254° 14'.0	39'.1	205° 26'.6	10'.0	60° 50'.8	01'.0
06	293° 33'.8	265° 23'.4	34'.4	269° 14'.7	39'.8	220° 28'.5	10'.1	75° 53'.4	00'.9
07	308° 36'.3	280° 22'.9	35'.5	284° 15'.4	40'.5	235° 30'.5	10'.2	90° 56'.1	00'.9
08	323° 38'.8	295° 22'.4	36'.7	299° 16'.1	41'.2	250° 32'.5	10'.2	105° 58'.7	00'.8
09	338° 41'.2	310° 22'.0	37'.8	314° 16'.8	41'.9	265° 34'.4	10'.3	121° 01'.4	00'.8
10	353° 43'.7	325° 21'.5	39'.0	329° 17'.4	42'.6	280° 36'.4	10'.3	136° 04'.0	00'.7
11	8° 46'.2	340° 21'.1	40'.1	344° 18'.1	43'.3	295° 38'.3	10'.4	151° 06'.6	00'.6
12	23° 48'.6	355° 20'.6	10° 41'.3 N	359° 18'.8	9° 44'.0 N	310° 40'.3	22° 10'.5 N	166° 09'.3	12° 00'.6 S
13	38° 51'.1	10° 20'.2	42'.5	14° 19'.5	44'.7	325° 42'.3	10'.5	181° 11'.9	00'.5
14	53° 53'.6	25° 19'.7	43'.6	29° 20'.2	45'.5	340° 44'.2	10'.6	196° 14'.6	00'.5
15	68° 56'.0	40° 19'.2	44'.8	44° 20'.9	46'.2	355° 46'.2	10'.6	211° 17'.2	00'.4
16	83° 58'.5	55° 18'.8	45'.9	59° 21'.6	46'.9	10° 48'.1	10'.7	226° 19'.8	00'.3
17	99° 00'.9	70° 18'.3	47'.1	74° 22'.3	47'.6	25° 50'.1	10'.8	241° 22'.5	00'.3
18	114° 03'.4	85° 17'.9	48'.2	89° 23'.0	48'.3	40° 52'.1	10'.8	256° 25'.1	00'.2
19	129° 05'.9	100° 17'.4	49'.4	104° 23'.7	49'.0	55° 54'.0	10'.9	271° 27'.8	00'.2
20	144° 08'.3	115° 16'.9	50'.5	119° 24'.3	49'.7	70° 56'.0	10'.9	286° 30'.4	00'.1
21	159° 10'.8	130° 16'.5	51'.7	134° 25'.0	50'.4	85° 57'.9	11'.0	301° 33'.0	00'.0
22	174° 13'.3	145° 16'.0	52'.8	149° 25'.7	51'.1	100° 59'.9	11'.1	316° 35'.7	00'.0
23	189° 15'.7	160° 15'.6	54'.0	164° 26'.4	51'.8	116° 01'.9	11'.1	331° 38'.3	11° 59'.9 S
	M.P. 10:25	v -0'.5	d 1'.2	v 0'.7	d 0'.7	v 2'.0	d 0'.1	v 2'.6	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.3 S
Achernar	335° 27'.5	57° 10'.2 S
Acrux	173° 08'.7	63° 10'.6 S
Adhara	255° 12'.7	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.2 N
Alkaid	152° 58'.5	49° 14'.7 N
Alnair	27° 44'.2	46° 53'.6 S
Alnilam	275° 46'.7	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.8	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.7 N
Altair	62° 08'.4	8° 54'.2 N
Ankaa	353° 16'.3	42° 14'.0 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.7	69° 02'.8 S
Avior	234° 17'.9	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.4	52° 42'.6 S
Capella	280° 34'.9	46° 00'.6 N
Deneb	49° 31'.7	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.9 S
Dubhe	193° 51'.4	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 46'.0	51° 29'.1 N
Enif	33° 47'.4	9° 56'.1 N
Fomalhaut	15° 24'.4	29° 33'.0 S
Gacrux	172° 00'.4	57° 11'.5 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.2 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 19'.0	74° 06'.0 N
Markab	13° 38'.7	15° 16'.5 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.3	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.4 N
Nunki	75° 58'.4	26° 16'.6 S
Peacock	53° 19'.6	56° 41'.2 S
Polaris	318° 15'.8	89° 19'.3 N
Pollux	243° 27'.9	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.4	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.5 S
Rigil Kent	139° 51'.2	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.5 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.9	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.4	43° 29'.6 S
Vega	80° 38'.9	38° 47'.6 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	333° 17'.0	12:18
Mars	336° 34'.0	12:04
Jupiter	287° 09'.7	15:20
Saturn	142° 14'.4	01:02

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
179° 51'.2	9° 01'.5 N	150° 44'.2	12'.0	17° 57'.3 N	4'.9	54'.7
194° 51'.3	02'.4	165° 15'.2	11'.9	18° 02'.2 N	4'.9	
209° 51'.5	03'.3	179° 46'.1	11'.9	07'.1	4'.7	
224° 51'.6	04'.2	194° 17'.0	11'.9	11'.8	4'.7	
239° 51'.8	05'.1	208° 47'.9	11'.9	16'.5	4'.5	
254° 51'.9	06'.1	223° 18'.8	11'.9	21'.0	4'.5	
269° 52'.1	07'.0	237° 49'.7	11'.9	25'.5	4'.4	
284° 52'.3	07'.9	252° 20'.6	11'.9	29'.9	4'.3	54'.6
299° 52'.4	08'.8	266° 51'.5	11'.9	34'.2	4'.2	
314° 52'.6	09'.7	281° 22'.4	11'.9	38'.4	4'.1	
329° 52'.7	10'.6	295° 53'.3	11'.8	42'.5	4'.0	
344° 52'.9	11'.5	310° 24'.1	11'.9	46'.5	3'.9	
359° 53'.0	9° 12'.4 N	324° 55'.0	11'.8	18° 50'.4 N	3'.9	54'.6
14° 53'.2	13'.3	339° 25'.8	11'.9	54'.3	3'.7	
29° 53'.4	14'.2	353° 56'.7	11'.8	58'.0	3'.7	54'.5
44° 53'.5	15'.1	8° 27'.5	11'.9	19° 01'.7 N	3'.5	
59° 53'.7	16'.0	22° 58'.4	11'.8	05'.2	3'.5	
74° 53'.8	16'.9	37° 29'.2	11'.8	08'.7	3'.4	
89° 54'.0	17'.8	52° 00'.0	11'.8	12'.1	3'.3	
104° 54'.1	18'.7	66° 30'.8	11'.8	15'.4	3'.2	
119° 54'.3	19'.6	81° 01'.6	11'.8	18'.6	3'.1	
134° 54'.4	20'.5	95° 32'.4	11'.9	21'.7	3'.0	
149° 54'.6	21'.4	110° 03'.3	11'.8	24'.7	2'.9	
164° 54'.8	22'.3	124° 34'.1	11'.8	27'.6	2'.8	54'.4
179° 54'.9	9° 23'.2 N	139° 04'.9	11'.8	19° 30'.4 N	2'.8	54'.4
194° 55'.1	24'.1	153° 35'.7	11'.7	33'.2	2'.6	
209° 55'.2	25'.0	168° 06'.4	11'.8	35'.8	2'.5	
224° 55'.4	25'.9	182° 37'.2	11'.8	38'.3	2'.5	
239° 55'.5	26'.8	197° 08'.0	11'.8	40'.8	2'.3	
254° 55'.7	27'.7	211° 38'.8	11'.8	43'.1	2'.3	
269° 55'.8	28'.6	226° 09'.6	11'.8	45'.4	2'.2	
284° 56'.0	29'.5	240° 40'.4	11'.8	47'.6	2'.0	
299° 56'.1	30'.4	255° 11'.2	11'.8	49'.6	2'.0	54'.3
314° 56'.3	31'.3	269° 42'.0	11'.8	51'.6	1'.9	
329° 56'.4	32'.2	284° 12'.8	11'.8	53'.5	1'.8	
344° 56'.6	33'.1	298° 43'.6	11'.8	55'.3	1'.7	
359° 56'.8	9° 34'.0 N	313° 14'.4	11'.8	19° 57'.0 N	1'.6	54'.3
14° 56'.9	34'.9	327° 45'.2	11'.7	58'.6	1'.5	
29° 57'.1	35'.8	342° 15'.9	11'.8	20° 00'.1 N	1'.4	
44° 57'.2	36'.7	356° 46'.7	11'.8	01'.5	1'.3	
59° 57'.4	37'.6	11° 17'.5	11'.9	02'.8	1'.3	
74° 57'.5	38'.5	25° 48'.4	11'.8	04'.1	1'.1	
89° 57'.7	39'.4	40° 19'.2	11'.8	05'.2	1'.0	
104° 57'.8	40'.3	54° 50'.0	11'.8	06'.2	1'.0	
119° 58'.0	41'.2	69° 20'.8	11'.8	07'.2	0'.8	
134° 58'.1	42'.1	83° 51'.6	11'.8	08'.0	0'.8	54'.2
149° 58'.3	43'.0	98° 22'.4	11'.9	08'.8	0'.6	
164° 58'.4	43'.9	112° 53'.3	11'.8	09'.4	0'.6	
179° 58'.6	9° 44'.8 N	127° 24'.1	11'.8	20° 10'.0 N	0'.5	54'.2
194° 58'.7	45'.6	141° 54'.9	11'.9	10'.5	0'.3	
209° 58'.9	46'.5	156° 25'.8	11'.8	10'.8	0'.3	
224° 59'.0	47'.4	170° 56'.6	11'.9	11'.1	0'.2	
239° 59'.2	48'.3	185° 27'.5	11'.9	11'.3	0'.1	
254° 59'.3	49'.2	199° 58'.4	11'.9	11'.4	0'.0	
269° 59'.5	50'.1	214° 29'.3	11'.8	11'.4	0'.1	
284° 59'.6	51'.0	229° 00'.1	11'.9	11'.3	0'.2	
299° 59'.8	51'.9	243° 31'.0	11'.9	11'.1	0'.3	
314° 59'.9	52'.8	258° 01'.9	11'.9	10'.8	0'.4	
330° 00'.1	53'.7	272° 32'.8	12'.0	10'.4	0'.4	
345° 00'.2	54'.6	287° 03'.8	11'.9	10'.0	0'.6	
0° 00'.4	9° 55'.5 N	301° 34'.7	11'.9	20° 09'.4 N	0'.6	54'.2
15° 00'.5	56'.4	316° 05'.6	12'.0	08'.8	0'.8	
30° 00'.7	57'.2	330° 36'.6	11'.9	08'.0	0'.8	
45° 00'.8	58'.1	345° 07'.5	12'.0	07'.2	1'.0	
60° 01'.0	59'.0	359° 38'.5	12'.0	06'.2	1'.0	
75° 01'.1	59'.9	14° 09'.5	12'.0	05'.2	1'.1	
90° 01'.3	10° 00'.8 N	28° 40'.5	12'.0	04'.1	1'.3	
105° 01'.4	01'.7	43° 11'.5	12'.0	02'.8	1'.3	
120° 01'.6	02'.6	57° 42'.5	12'.0	01'.5	1'.4	
135° 01'.7	03'.5	72° 13'.5	12'.1	00'.1	1'.5	
150° 01'.9	04'.4	86° 44'.6	12'.0	19° 58'.6 N	1'.6	
165° 02'.0	05'.2	101° 15'.6	12'.1	57'.0	1'.6	
SD 15'.9	d 0'.9	SD 14'.9		14'.8	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 13	Moonrise 14	Moonrise 15
N 72°	-	02:06	03:44	-	-	-
N 70°	-	02:40	04:00	03:47	03:40	-
68°	00:54	03:04	04:13	04:28	04:45	05:21
66°	01:49	03:23	04:23	04:56	05:21	06:01
64°	02:20	03:38	04:32	05:17	05:47	06:29
62°	02:42	03:50	04:40	05:34	06:07	06:50
60°	03:00	04:00	04:46	05:48	06:23	07:07
N 58°	03:14	04:09	04:52	06:01	06:37	07:21
56°	03:26	04:17	04:57	06:11	06:49	07:34
54°	03:36	04:24	05:01	06:21	06:59	07:45
52°	03:45	04:30	05:05	06:29	07:09	07:54
50°	03:53	04:35	05:09	06:37	07:17	08:03
45°	04:10	04:46	05:17	06:53	07:35	08:21
N 40°	04:22	04:56	05:24	07:06	07:49	08:36
35°	04:32	05:03	05:29	07:17	08:01	08:48
30°	04:41	05:10	05:34	07:27	08:12	08:59
20°	04:54	05:20	05:43	07:44	08:30	09:18
N 10°	05:04	05:29	05:50	07:59	08:47	09:35
0°	05:12	05:36	05:57	08:13	09:02	09:50
S 10°	05:18	05:42	06:04	08:27	09:17	10:05
20°	05:23	05:48	06:11	08:43	09:33	10:22
30°	05:26	05:54	06:18	09:00	09:52	10:41
35°	05:28	05:57	06:23	09:10	10:02	10:52
40°	05:29	06:01	06:28	09:22	10:15	11:04
45°	05:30	06:04	06:34	09:35	10:30	11:19
S 50°	05:31	06:08	06:41	09:52	10:48	11:37
52°	05:31	06:10	06:44	10:00	10:56	11:46
54°	05:31	06:12	06:48	10:09	11:06	11:56
56°	05:30	06:14	06:51	10:19	11:17	12:07
58°	05:30	06:16	06:56	10:30	11:29	12:19
S 60°	05:30	06:18	07:01	10:43	11:43	12:34
S 62°	05:29	06:21	07:06	10:58	12:00	12:51

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 13	Moonset 14	Moonset 15
N 72°	20:20	22:02	-	-	-	-
N 70°	20:03	21:25	-	00:07	01:54	-
68°	19:50	21:00	23:24	-	00:49	01:53
66°	19:39	20:41	22:19	-	00:14	01:14
64°	19:30	20:25	21:45	23:48	-	00:46
62°	19:23	20:13	21:22	23:28	-	00:25
60°	19:16	20:02	21:04	23:12	-	00:08
N 58°	19:10	19:53	20:49	22:59	23:53	24:39
56°	19:05	19:45	20:36	22:47	23:41	24:27
54°	19:00	19:38	20:26	22:36	23:30	24:16
52°	18:56	19:32	20:17	22:27	23:21	24:07
50°	18:52	19:27	20:09	22:19	23:12	23:59
45°	18:44	19:15	19:52	22:02	22:54	23:41
N 40°	18:37	19:06	19:39	21:48	22:39	23:26
35°	18:32	18:58	19:29	21:36	22:26	23:14
30°	18:27	18:51	19:20	21:25	22:15	23:03
20°	18:18	18:40	19:07	21:07	21:57	22:44
N 10°	18:10	18:32	18:57	20:51	21:40	22:28
0°	18:04	18:25	18:49	20:37	21:25	22:13
S 10°	17:57	18:18	18:43	20:22	21:10	21:58
20°	17:50	18:12	18:38	20:06	20:53	21:42
30°	17:42	18:06	18:34	19:48	20:34	21:23
35°	17:37	18:03	18:32	19:38	20:23	21:12
40°	17:32	17:59	18:31	19:26	20:11	20:59
45°	17:26	17:56	18:30	19:12	19:56	20:45
S 50°	17:19	17:52	18:29	18:55	19:38	20:26
52°	17:16	17:50	18:29	18:47	19:29	20:18
54°	17:12	17:48	18:29	18:38	19:19	20:08
56°	17:08	17:46	18:29	18:28	19:09	19:57
58°	17:04	17:44	18:29	18:16	18:56	19:45
S 60°	16:59	17:41	18:29	18:03	18:42	19:31
S 62°	16:53	17:39	18:30	17:47	18:24	19:13

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
13	0 36	0 28	12:00	14:25	02:01	3d 9%
14	0 21	0 13	12:00	15:13	02:49	4d 15%
15	0 06	0 01	12:00	16:01	03:37	5d 23%

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2013 April 16, 17, 18 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.0		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
16 Tuesday 00	204° 18'.2	175° 15'.1	10° 55'.1 N	179° 27'.1	9° 52'.5 N	131° 03'.8	22° 11'.2 N	346° 41'.0	11° 59'.9 S
01	219° 20'.7	190° 14'.6	56'.2	194° 27'.8	53'.2	146° 05'.8	11'.2	1° 43'.6	59'.8
02	234° 23'.1	205° 14'.2	57'.4	209° 28'.5	53'.9	161° 07'.7	11'.3	16° 46'.2	59'.7
03	249° 25'.6	220° 13'.7	58'.5	224° 29'.2	54'.6	176° 09'.7	11'.4	31° 48'.9	59'.7
04	264° 28'.0	235° 13'.2	59'.7	239° 29'.9	55'.3	191° 11'.6	11'.4	46° 51'.5	59'.6
05	279° 30'.5	250° 12'.8	11° 00'.8 N	254° 30'.5	56'.0	206° 13'.6	11'.5	61° 54'.2	59'.6
06	294° 33'.0	265° 12'.3	02'.0	269° 31'.2	56'.7	221° 15'.6	11'.5	76° 56'.8	59'.5
07	309° 35'.4	280° 11'.8	03'.1	284° 31'.9	57'.4	236° 17'.5	11'.6	91° 59'.4	59'.5
08	324° 37'.9	295° 11'.4	04'.3	299° 32'.6	58'.1	251° 19'.5	11'.7	107° 02'.1	59'.4
09	339° 40'.4	310° 10'.9	05'.4	314° 33'.3	58'.8	266° 21'.4	11'.7	122° 04'.7	59'.3
10	354° 42'.8	325° 10'.5	06'.5	329° 34'.0	59'.5	281° 23'.4	11'.8	137° 07'.4	59'.3
11	9° 45'.3	340° 10'.0	07'.7	344° 34'.7	10° 00'.2 N	296° 25'.3	11'.8	152° 10'.0	59'.2
12	24° 47'.8	355° 09'.5	11° 08'.8 N	359° 35'.4	10° 00'.9 N	311° 27'.3	22° 11'.9 N	167° 12'.6	11° 59'.2 S
13	39° 50'.2	10° 09'.1	10'.0	14° 36'.1	01'.6	326° 29'.2	12'.0	182° 15'.3	59'.1
14	54° 52'.7	25° 08'.6	11'.1	29° 36'.7	02'.3	341° 31'.2	12'.0	197° 17'.9	59'.0
15	69° 55'.2	40° 08'.1	12'.3	44° 37'.4	03'.0	356° 33'.2	12'.1	212° 20'.6	59'.0
16	84° 57'.6	55° 07'.7	13'.4	59° 38'.1	03'.7	11° 35'.1	12'.1	227° 23'.2	58'.9
17	100° 00'.1	70° 07'.2	14'.5	74° 38'.8	04'.4	26° 37'.1	12'.2	242° 25'.9	58'.9
18	115° 02'.5	85° 06'.7	15'.7	89° 39'.5	05'.1	41° 39'.0	12'.3	257° 28'.5	58'.8
19	130° 05'.0	100° 06'.2	16'.8	104° 40'.2	05'.8	56° 41'.0	12'.3	272° 31'.1	58'.7
20	145° 07'.5	115° 05'.8	18'.0	119° 40'.9	06'.6	71° 42'.9	12'.4	287° 33'.8	58'.7
21	160° 09'.9	130° 05'.3	19'.1	134° 41'.6	07'.3	86° 44'.9	12'.4	302° 36'.4	58'.6
22	175° 12'.4	145° 04'.8	20'.2	149° 42'.3	08'.0	101° 46'.8	12'.5	317° 39'.1	58'.6
23	190° 14'.9	160° 04'.4	21'.4	164° 42'.9	08'.7	116° 48'.8	12'.6	332° 41'.7	58'.5
17 Wednesday 00	205° 17'.3	175° 03'.9	11° 22'.5 N	179° 43'.6	10° 09'.4 N	131° 50'.8	22° 12'.6 N	347° 44'.3	11° 58'.4 S
01	220° 19'.8	190° 03'.4	23'.6	194° 44'.3	10'.0	146° 52'.7	12'.7	2° 47'.0	58'.4
02	235° 22'.3	205° 03'.0	24'.8	209° 45'.0	10'.7	161° 54'.7	12'.7	17° 49'.6	58'.3
03	250° 24'.7	220° 02'.5	25'.9	224° 45'.7	11'.4	176° 56'.6	12'.8	32° 52'.3	58'.3
04	265° 27'.2	235° 02'.0	27'.0	239° 46'.4	12'.1	191° 58'.6	12'.9	47° 54'.9	58'.2
05	280° 29'.7	250° 01'.5	28'.2	254° 47'.1	12'.8	207° 00'.5	12'.9	62° 57'.5	58'.1
06	295° 32'.1	265° 01'.1	29'.3	269° 47'.8	13'.5	222° 02'.5	13'.0	78° 00'.2	58'.1
07	310° 34'.6	280° 00'.6	30'.4	284° 48'.5	14'.2	237° 04'.4	13'.0	93° 02'.8	58'.0
08	325° 37'.0	295° 00'.1	31'.6	299° 49'.1	14'.9	252° 06'.4	13'.1	108° 05'.5	58'.0
09	340° 39'.5	309° 59'.7	32'.7	314° 49'.8	15'.6	267° 08'.3	13'.2	123° 08'.1	57'.9
10	355° 42'.0	324° 59'.2	33'.8	329° 50'.5	16'.3	282° 10'.3	13'.2	138° 10'.8	57'.8
11	10° 44'.4	339° 58'.7	35'.0	344° 51'.2	17'.0	297° 12'.2	13'.3	153° 13'.4	57'.8
12	25° 46'.9	354° 58'.2	11° 36'.1 N	359° 51'.9	10° 17'.7 N	312° 14'.2	22° 13'.3 N	168° 16'.0	11° 57'.7 S
13	40° 49'.4	9° 57'.8	37'.2	14° 52'.6	18'.4	327° 16'.1	13'.4	183° 18'.7	57'.7
14	55° 51'.8	24° 57'.3	38'.4	29° 53'.3	19'.1	342° 18'.1	13'.5	198° 21'.3	57'.6
15	70° 54'.3	39° 56'.8	39'.5	44° 54'.0	19'.8	357° 20'.0	13'.5	213° 24'.0	57'.5
16	85° 56'.8	54° 56'.3	40'.6	59° 54'.6	20'.5	12° 22'.0	13'.6	228° 26'.6	57'.5
17	100° 59'.2	69° 55'.9	41'.7	74° 55'.3	21'.2	27° 23'.9	13'.6	243° 29'.2	57'.4
18	116° 01'.7	84° 55'.4	42'.9	89° 56'.0	21'.9	42° 25'.9	13'.7	258° 31'.9	57'.4
19	131° 04'.1	99° 54'.9	44'.0	104° 56'.7	22'.6	57° 27'.8	13'.8	273° 34'.5	57'.3
20	146° 06'.6	114° 54'.4	45'.1	119° 57'.4	23'.3	72° 29'.8	13'.8	288° 37'.2	57'.2
21	161° 09'.1	129° 53'.9	46'.3	134° 58'.1	24'.0	87° 31'.7	13'.9	303° 39'.8	57'.2
22	176° 11'.5	144° 53'.5	47'.4	149° 58'.8	24'.7	102° 33'.7	13'.9	318° 42'.5	57'.1
23	191° 14'.0	159° 53'.0	48'.5	164° 59'.5	25'.4	117° 35'.6	14'.0	333° 45'.1	57'.1
18 Thursday 00	206° 16'.5	174° 52'.5	11° 49'.6 N	180° 00'.1	10° 26'.1 N	132° 37'.6	22° 14'.1 N	348° 47'.7	11° 57'.0 S
01	221° 18'.9	189° 52'.0	50'.8	195° 00'.8	26'.8	147° 39'.5	14'.1	3° 50'.4	56'.9
02	236° 21'.4	204° 51'.6	51'.9	210° 01'.5	27'.5	162° 41'.5	14'.2	18° 53'.0	56'.9
03	251° 23'.9	219° 51'.1	53'.0	225° 02'.2	28'.2	177° 43'.4	14'.2	33° 55'.7	56'.8
04	266° 26'.3	234° 50'.6	54'.1	240° 02'.9	28'.9	192° 45'.4	14'.3	48° 58'.3	56'.8
05	281° 28'.8	249° 50'.1	55'.3	255° 03'.6	29'.6	207° 47'.3	14'.4	64° 01'.0	56'.7
06	296° 31'.3	264° 49'.6	56'.4	270° 04'.3	30'.3	222° 49'.3	14'.4	79° 03'.6	56'.6
07	311° 33'.7	279° 49'.1	57'.5	285° 05'.0	30'.9	237° 51'.2	14'.5	94° 06'.2	56'.6
08	326° 36'.2	294° 48'.7	58'.6	300° 05'.6	31'.6	252° 53'.2	14'.5	109° 08'.9	56'.5
09	341° 38'.6	309° 48'.2	59'.7	315° 06'.3	32'.3	267° 55'.1	14'.6	124° 11'.5	56'.5
10	356° 41'.1	324° 47'.7	12° 00'.9 N	330° 07'.0	33'.0	282° 57'.1	14'.7	139° 14'.2	56'.4
11	11° 43'.6	339° 47'.2	02'.0	345° 07'.7	33'.7	297° 59'.0	14'.7	154° 16'.8	56'.3
12	26° 46'.0	354° 46'.7	12° 03'.1 N	0° 08'.4	10° 34'.4 N	313° 01'.0	22° 14'.8 N	169° 19'.5	11° 56'.3 S
13	41° 48'.5	9° 46'.3	04'.2	15° 09'.1	35'.1	328° 02'.9	14'.8	184° 22'.1	56'.2
14	56° 51'.0	24° 45'.8	05'.3	30° 09'.8	35'.8	343° 04'.9	14'.9	199° 24'.7	56'.2
15	71° 53'.4	39° 45'.3	06'.4	45° 10'.4	36'.5	358° 06'.8	15'.0	214° 27'.4	56'.1
16	86° 55'.9	54° 44'.8	07'.6	60° 11'.1	37'.2	13° 08'.8	15'.0	229° 30'.0	56'.0
17	101° 58'.4	69° 44'.3	08'.7	75° 11'.8	37'.9	28° 10'.7	15'.1	244° 32'.7	56'.0
18	117° 00'.8	84° 43'.8	09'.8	90° 12'.5	38'.6	43° 12'.7	15'.1	259° 35'.3	55'.9
19	132° 03'.3	99° 43'.3	10'.9	105° 13'.2	39'.3	58° 14'.6	15'.2	274° 38'.0	55'.9
20	147° 05'.8	114° 42'.9	12'.0	120° 13'.9	39'.9	73° 16'.6	15'.2	289° 40'.6	55'.8
21	162° 08'.2	129° 42'.4	13'.1	135° 14'.6	40'.6	88° 18'.5	15'.3	304° 43'.2	55'.7
22	177° 10'.7	144° 41'.9	14'.3	150° 15'.2	41'.3	103° 20'.5	15'.4	319° 45'.9	55'.7
23	192° 13'.1	159° 41'.4	15'.4	165° 15'.9	42'.0	118° 22'.4	15'.4	334° 48'.5	55'.6
	M.P. 10:13	v -0'.5	d 1'.1	v 0'.7	d 0'.7	v 2'.0	d 0'.1	v 2'.6	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.3 S
Achernar	335° 27'.5	57° 10'.2 S
Acrux	173° 08'.7	63° 10'.6 S
Adhara	255° 12'.7	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.2 N
Alkaid	152° 58'.5	49° 14'.7 N
Alnair	27° 44'.1	46° 53'.5 S
Alnilam	275° 46'.7	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.8	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.7 N
Altair	62° 08'.3	8° 54'.2 N
Ankaa	353° 16'.2	42° 14'.0 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.6	69° 02'.8 S
Avior	234° 18'.0	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.4	52° 42'.6 S
Capella	280° 34'.9	46° 00'.6 N
Deneb	49° 31'.6	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.9 S
Dubhe	193° 51'.4	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.9	51° 29'.1 N
Enif	33° 47'.4	9° 56'.1 N
Fomalhaut	15° 24'.4	29° 33'.0 S
Gacrux	172° 00'.4	57° 11'.5 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.3 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.0 N
Markab	13° 38'.7	15° 16'.5 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.3	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.4 N
Nunki	75° 58'.4	26° 16'.6 S
Peacock	53° 19'.5	56° 41'.2 S
Polaris	318° 16'.0	89° 19'.3 N
Pollux	243° 27'.9	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.4	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.5 S
Rigil Kent	139° 51'.2	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.4 S
Schedar	349° 41'.2	56° 36'.5 N
Shaula	96° 21'.8	37° 06'.6 S
Sirius	258° 33'.9	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.4	43° 29'.6 S
Vega	80° 38'.9	38° 47'.6 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	329° 46'.6	12:20
Mars	334° 26'.3	12:01
Jupiter	286° 33'.4	15:11
Saturn	142° 27'.0	00:49

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
16 00	180° 02'.2	10° 06'.1 N	115° 46'.7	12'.1	19° 55'.4 N	1'.8	54'.2
01	195° 02'.3	07'.0	130° 17'.8	12'.1	53'.6	1'.9	
02	210° 02'.5	07'.9	144° 48'.9	12'.1	51'.7	1'.9	
03	225° 02'.6	08'.8	159° 20'.0	12'.1	49'.8	2'.1	
04	240° 02'.8	09'.7	173° 51'.1	12'.1	47'.7	2'.1	
05	255° 02'.9	10'.6	188° 22'.2	12'.2	45'.6	2'.2	
06	270° 03'.1	11'.4	202° 53'.4	12'.1	43'.4	2'.4	
07	285° 03'.2	12'.3	217° 24'.5	12'.2	41'.0	2'.4	
08	300° 03'.3	13'.2	231° 55'.7	12'.2	38'.6	2'.5	
09	315° 03'.5	14'.1	246° 26'.9	12'.2	36'.1	2'.5	
10	330° 03'.6	15'.0	260° 58'.1	12'.3	33'.6	2'.7	
11	345° 03'.8	15'.9	275° 29'.4	12'.2	30'.9	2'.8	
12	0° 03'.9	10° 16'.8 N	290° 00'.6	12'.2	19° 28'.1 N	2'.9	54'.2
13	15° 04'.1	17'.6	304° 31'.8	12'.3	25'.2	2'.9	
14	30° 04'.2	18'.5	319° 03'.1	12'.3	22'.3	3'.0	
15	45° 04'.4	19'.4	333° 34'.4	12'.3	19'.3	3'.2	
16	60° 04'.5	20'.3	348° 05'.7	12'.3	16'.1	3'.2	
17	75° 04'.7	21'.2	2° 37'.0	12'.4	12'.9	3'.3	
18	90° 04'.8	22'.0	17° 08'.4	12'.3	09'.6	3'.4	
19	105° 04'.9	22'.9	31° 39'.7	12'.4	06'.2	3'.4	
20	120° 05'.1	23'.8	46° 11'.1	12'.4	02'.8	3'.6	
21	135° 05'.2	24'.7	60° 42'.5	12'.4	18° 59'.2 N	3'.7	
22	150° 05'.4	25'.6	75° 13'.9	12'.4	55'.5	3'.7	
23	165° 05'.5	26'.5	89° 45'.3	12'.4	51'.8	3'.8	
17 00	180° 05'.7	10° 27'.3 N	104° 16'.7	12'.5	18° 48'.0 N	3'.9	54'.3
01	195° 05'.8	28'.2	118° 48'.2	12'.4	44'.1	4'.0	
02	210° 06'.0	29'.1	133° 19'.6	12'.5	40'.1	4'.1	
03	225° 06'.1	30'.0	147° 51'.1	12'.5	36'.0	4'.2	
04	240° 06'.2	30'.9	162° 22'.6	12'.5	31'.8	4'.2	
05	255° 06'.4	31'.7	176° 54'.1	12'.6	27'.6	4'.4	
06	270° 06'.5	32'.6	191° 25'.7	12'.5	23'.2	4'.4	
07	285° 06'.7	33'.5	205° 57'.2	12'.6	18'.8	4'.5	
08	300° 06'.8	34'.4	220° 28'.8	12'.6	14'.3	4'.6	
09	315° 07'.0	35'.2	235° 00'.4	12'.6	09'.7	4'.7	
10	330° 07'.1	36'.1	249° 32'.0	12'.6	05'.0	4'.7	
11	345° 07'.2	37'.0	264° 03'.6	12'.7	00'.3	4'.8	
12	0° 07'.4	10° 37'.9 N	278° 35'.3	12'.6	17° 55'.5 N	5'.0	54'.4
13	15° 07'.5	38'.7	293° 06'.9	12'.7	50'.5	5'.0	
14	30° 07'.7	39'.6	307° 38'.6	12'.7	45'.5	5'.1	
15	45° 07'.8	40'.5	322° 10'.3	12'.7	40'.4	5'.1	
16	60° 08'.0	41'.4	336° 42'.0	12'.7	35'.3	5'.3	
17	75° 08'.1	42'.3	351° 13'.7	12'.8	30'.0	5'.3	
18	90° 08'.2	43'.1	5° 45'.5	12'.7	24'.7	5'.4	
19	105° 08'.4	44'.0	20° 17'.2	12'.8	19'.3	5'.5	
20	120° 08'.5	44'.9	34° 49'.0	12'.8	13'.8	5'.6	54'.5
21	135° 08'.7	45'.7	49° 20'.8	12'.8	08'.2	5'.6	
22	150° 08'.8	46'.6	63° 52'.6	12'.8	02'.6	5'.8	
23	165° 08'.9	47'.5	78° 24'.4	12'.9	16° 56'.8 N	5'.8	
18 00	180° 09'.1	10° 48'.4 N	92° 56'.3	12'.8	16° 51'.0 N	5'.9	54'.5
01	195° 09'.2	49'.2	107° 28'.1	12'.9	45'.1	5'.9	
02	210° 09'.4	50'.1	122° 00'.0	12'.9	39'.2	6'.1	
03	225° 09'.5	51'.0	136° 31'.9	12'.9	33'.1	6'.1	54'.6
04	240° 09'.6	51'.9	151° 03'.8	12'.9	27'.0	6'.2	
05	255° 09'.8	52'.7	165° 35'.7	13'.0	20'.8	6'.3	
06	270° 09'.9	53'.6	180° 07'.7	12'.9	14'.5	6'.3	
07	285° 10'.1	54'.5	194° 39'.6	13'.0	08'.2	6'.5	
08	300° 10'.2	55'.3	209° 11'.6	12'.9	01'.7	6'.5	
09	315° 10'.3	56'.2	223° 43'.5	13'.0	15° 55'.2 N	6'.6	54'.7
10	330° 10'.5	57'.1	238° 15'.5	13'.0	48'.6	6'.6	
11	345° 10'.6	57'.9	252° 47'.5	13'.1	42'.0	6'.7	
12	0° 10'.7	10° 58'.8 N	267° 19'.6	13'.0	15° 35'.3 N	6'.9	54'.7
13	15° 10'.9	59'.7	281° 51'.6	13'.0	28'.4	6'.8	
14	30° 11'.0	11° 00'.6 N	296° 23'.6	13'.1	21'.6	7'.0	
15	45° 11'.2	01'.4	310° 55'.7	13'.1	14'.6	7'.0	54'.8
16	60° 11'.3	02'.3	325° 27'.8	13'.1	07'.6	7'.1	
17	75° 11'.4	03'.2	339° 59'.9	13'.1	00'.5	7'.2	
18	90° 11'.6	04'.0	354° 32'.0	13'.1	14° 53'.3 N	7'.2	
19	105° 11'.7	04'.9	9° 04'.1	13'.1	46'.1	7'.3	
20	120° 11'.8	05'.8	23° 36'.2	13'.1	38'.8	7'.4	54'.9
21	135° 12'.0	06'.6	38° 08'.3	13'.2	31'.4	7'.5	
22	150° 12'.1	07'.5	52° 40'.5	13'.1	23'.9	7'.5	
23	165° 12'.3	08'.4	67° 12'.6	13'.2	16'.4	7'.6	
	SD 15'.9	d 0'.9	SD 14'.8		14'.8		14'.9

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18
N 72°	-	01:36	03:27	-	-	07:57
N 70°	-	02:19	03:45	05:11	06:57	08:39
68°	-	02:48	04:00	06:22	07:40	09:07
66°	01:23	03:09	04:12	06:58	08:09	09:29
64°	02:02	03:26	04:22	07:24	08:31	09:45
62°	02:28	03:39	04:30	07:44	08:48	09:59
60°	02:47	03:50	04:37	08:01	09:03	10:11
N 58°	03:03	04:00	04:44	08:14	09:15	10:21
56°	03:17	04:09	04:49	08:26	09:25	10:30
54°	03:28	04:16	04:54	08:37	09:35	10:38
52°	03:38	04:23	04:59	08:46	09:43	10:45
50°	03:46	04:29	05:03	08:54	09:51	10:51
45°	04:04	04:41	05:12	09:12	10:06	11:04
N 40°	04:17	04:51	05:19	09:26	10:19	11:15
35°	04:28	04:59	05:25	09:38	10:31	11:25
30°	04:37	05:06	05:31	09:49	10:40	11:33
20°	04:52	05:18	05:40	10:07	10:57	11:47
N 10°	05:02	05:27	05:49	10:23	11:11	12:00
0°	05:11	05:35	05:56	10:38	11:25	12:11
S 10°	05:18	05:42	06:04	10:53	11:38	12:23
20°	05:23	05:49	06:11	11:08	11:53	12:35
30°	05:28	05:56	06:20	11:27	12:09	12:50
35°	05:30	06:00	06:25	11:37	12:19	12:58
40°	05:32	06:04	06:31	11:49	12:30	13:07
45°	05:34	06:08	06:38	12:03	12:43	13:18
S 50°	05:35	06:13	06:45	12:21	12:58	13:31
52°	05:35	06:15	06:49	12:29	13:06	13:37
54°	05:36	06:17	06:53	12:38	13:14	13:44
56°	05:36	06:19	06:57	12:48	13:23	13:51
58°	05:36	06:22	07:02	13:00	13:33	14:00
S 60°	05:36	06:25	07:08	13:14	13:45	14:09
S 62°	05:36	06:28	07:14	13:30	13:59	14:20

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 16	Moonset 17	Moonset 18
N 72°	20:36	22:34	-	-	-	04:14
N 70°	20:17	21:45	-	03:44	03:36	03:31
68°	20:02	21:15	-	02:33	02:52	03:02
66°	19:50	20:53	22:45	01:56	02:23	02:40
64°	19:39	20:36	22:03	01:30	02:01	02:22
62°	19:31	20:22	21:35	01:10	01:43	02:08
60°	19:23	20:11	21:15	00:53	01:28	01:56
N 58°	19:17	20:01	20:58	00:39	01:16	01:45
56°	19:11	19:52	20:45	00:27	01:05	01:36
54°	19:06	19:44	20:33	00:16	00:55	01:28
52°	19:01	19:38	20:23	00:07	00:47	01:21
50°	18:57	19:32	20:14	-	00:39	01:14
45°	18:48	19:19	19:57	-	00:23	01:00
N 40°	18:41	19:09	19:43	-	00:09	00:48
35°	18:34	19:00	19:32	23:57	-	00:38
30°	18:29	18:53	19:22	23:47	-	00:29
20°	18:19	18:41	19:08	23:30	-	00:14
N 10°	18:11	18:32	18:57	23:15	-	00:00
0°	18:03	18:24	18:48	23:01	23:47	24:34
S 10°	17:55	18:17	18:41	22:46	23:35	24:23
20°	17:47	18:10	18:35	22:31	23:21	24:12
30°	17:38	18:03	18:30	22:13	23:06	23:59
35°	17:33	17:59	18:28	22:03	22:56	23:52
40°	17:27	17:55	18:26	21:51	22:46	23:43
45°	17:21	17:51	18:25	21:37	22:34	23:33
S 50°	17:13	17:46	18:23	21:20	22:19	23:21
52°	17:09	17:44	18:23	21:12	22:12	23:15
54°	17:05	17:41	18:22	21:03	22:04	23:09
56°	17:01	17:39	18:22	20:53	21:55	23:02
58°	16:56	17:36	18:22	20:42	21:45	22:54
S 60°	16:50	17:33	18:21	20:29	21:34	22:45
S 62°	16:44	17:30	18:21	20:13	21:21	22:35

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
16	0 08	0 15	12:00	16:49	04:25	6d 31%
17	0 22	0 29	12:00	17:36	05:13	7d 40%
18	0 36	0 43	11:59	18:23	05:59	8d 50%

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2013 April 19, 20, 21 (Fri, Sat, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.0		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
19 Friday 00	207° 15'.6	174° 40'.9	12° 16'.5 N	180° 16'.6	10° 42'.7 N	133° 24'.4	22° 15'.5 N	349° 51'.2	11° 55'.6 S
01	222° 18'.1	189° 40'.4	17'.6	195° 17'.3	43'.4	148° 26'.3	15'.5	4° 53'.8	55'.5
02	237° 20'.5	204° 39'.9	18'.7	210° 18'.0	44'.1	163° 28'.3	15'.6	19° 56'.5	55'.4
03	252° 23'.0	219° 39'.4	19'.8	225° 18'.7	44'.8	178° 30'.2	15'.7	34° 59'.1	55'.4
04	267° 25'.5	234° 39'.0	20'.9	240° 19'.4	45'.5	193° 32'.1	15'.7	50° 01'.7	55'.3
05	282° 27'.9	249° 38'.5	22'.0	255° 20'.1	46'.2	208° 34'.1	15'.8	65° 04'.4	55'.3
06	297° 30'.4	264° 38'.0	23'.1	270° 20'.7	46'.8	223° 36'.0	15'.8	80° 07'.0	55'.2
07	312° 32'.9	279° 37'.5	24'.3	285° 21'.4	47'.5	238° 38'.0	15'.9	95° 09'.7	55'.1
08	327° 35'.3	294° 37'.0	25'.4	300° 22'.1	48'.2	253° 39'.9	16'.0	110° 12'.3	55'.1
09	342° 37'.8	309° 36'.5	26'.5	315° 22'.8	48'.9	268° 41'.9	16'.0	125° 15'.0	55'.0
10	357° 40'.2	324° 36'.0	27'.6	330° 23'.5	49'.6	283° 43'.8	16'.1	140° 17'.6	55'.0
11	12° 42'.7	339° 35'.5	28'.7	345° 24'.2	50'.3	298° 45'.8	16'.1	155° 20'.3	54'.9
12	27° 45'.2	354° 35'.0	12° 29'.8 N	0° 24'.8	10° 51'.0 N	313° 47'.7	22° 16'.2 N	170° 22'.9	11° 54'.8 S
13	42° 47'.6	9° 34'.5	30'.9	15° 25'.5	51'.7	328° 49'.7	16'.3	185° 25'.5	54'.8
14	57° 50'.1	24° 34'.0	32'.0	30° 26'.2	52'.3	343° 51'.6	16'.3	200° 28'.2	54'.7
15	72° 52'.6	39° 33'.6	33'.1	45° 26'.9	53'.0	358° 53'.5	16'.4	215° 30'.8	54'.7
16	87° 55'.0	54° 33'.1	34'.2	60° 27'.6	53'.7	13° 55'.5	16'.4	230° 33'.5	54'.6
17	102° 57'.5	69° 32'.6	35'.3	75° 28'.3	54'.4	28° 57'.4	16'.5	245° 36'.1	54'.5
18	118° 00'.0	84° 32'.1	36'.4	90° 29'.0	55'.1	43° 59'.4	16'.5	260° 38'.8	54'.5
19	133° 02'.4	99° 31'.6	37'.5	105° 29'.6	55'.8	59° 01'.3	16'.6	275° 41'.4	54'.4
20	148° 04'.9	114° 31'.1	38'.6	120° 30'.3	56'.5	74° 03'.3	16'.7	290° 44'.0	54'.4
21	163° 07'.4	129° 30'.6	39'.7	135° 31'.0	57'.2	89° 05'.2	16'.7	305° 46'.7	54'.3
22	178° 09'.8	144° 30'.1	40'.8	150° 31'.7	57'.8	104° 07'.1	16'.8	320° 49'.3	54'.2
23	193° 12'.3	159° 29'.6	41'.9	165° 32'.4	58'.5	119° 09'.1	16'.8	335° 52'.0	54'.2
20 Saturday 00	208° 14'.7	174° 29'.1	12° 43'.0 N	180° 33'.1	10° 59'.2 N	134° 11'.0	22° 16'.9 N	350° 54'.6	11° 54'.1 S
01	223° 17'.2	189° 28'.6	44'.1	195° 33'.8	59'.9	149° 13'.0	17'.0	5° 57'.3	54'.1
02	238° 19'.7	204° 28'.1	45'.2	210° 34'.4	11° 00'.6 N	164° 14'.9	17'.0	20° 59'.9	54'.0
03	253° 22'.1	219° 27'.6	46'.3	225° 35'.1	01'.3	179° 16'.9	17'.1	36° 02'.6	53'.9
04	268° 24'.6	234° 27'.1	47'.4	240° 35'.8	01'.9	194° 18'.8	17'.1	51° 05'.2	53'.9
05	283° 27'.1	249° 26'.6	48'.5	255° 36'.5	02'.6	209° 20'.7	17'.2	66° 07'.8	53'.8
06	298° 29'.5	264° 26'.1	49'.6	270° 37'.2	03'.3	224° 22'.7	17'.3	81° 10'.5	53'.8
07	313° 32'.0	279° 25'.6	50'.7	285° 37'.9	04'.0	239° 24'.6	17'.3	96° 13'.1	53'.7
08	328° 34'.5	294° 25'.1	51'.8	300° 38'.5	04'.7	254° 26'.6	17'.4	111° 15'.8	53'.6
09	343° 36'.9	309° 24'.6	52'.9	315° 39'.2	05'.4	269° 28'.5	17'.4	126° 18'.4	53'.6
10	358° 39'.4	324° 24'.1	54'.0	330° 39'.9	06'.1	284° 30'.5	17'.5	141° 21'.1	53'.5
11	13° 41'.9	339° 23'.6	55'.1	345° 40'.6	06'.7	299° 32'.4	17'.5	156° 23'.7	53'.5
12	28° 44'.3	354° 23'.1	12° 56'.2 N	0° 41'.3	11° 07'.4 N	314° 34'.3	22° 17'.6 N	171° 26'.4	11° 53'.4 S
13	43° 46'.8	9° 22'.6	57'.3	15° 42'.0	08'.1	329° 36'.3	17'.7	186° 29'.0	53'.3
14	58° 49'.2	24° 22'.1	58'.4	30° 42'.6	08'.8	344° 38'.2	17'.7	201° 31'.6	53'.3
15	73° 51'.7	39° 21'.6	59'.5	45° 43'.3	09'.5	359° 40'.2	17'.8	216° 34'.3	53'.2
16	88° 54'.2	54° 21'.1	13° 00'.6 N	60° 44'.0	10'.1	14° 42'.1	17'.8	231° 36'.9	53'.2
17	103° 56'.6	69° 20'.6	01'.7	75° 44'.7	10'.8	29° 44'.0	17'.9	246° 39'.6	53'.1
18	118° 59'.1	84° 20'.1	02'.8	90° 45'.4	11'.5	44° 46'.0	18'.0	261° 42'.2	53'.0
19	134° 01'.6	99° 19'.6	03'.8	105° 46'.1	12'.2	59° 47'.9	18'.0	276° 44'.9	53'.0
20	149° 04'.0	114° 19'.1	04'.9	120° 46'.8	12'.9	74° 49'.9	18'.1	291° 47'.5	52'.9
21	164° 06'.5	129° 18'.6	06'.0	135° 47'.4	13'.6	89° 51'.8	18'.1	306° 50'.2	52'.9
22	179° 09'.0	144° 18'.1	07'.1	150° 48'.1	14'.2	104° 53'.7	18'.2	321° 52'.8	52'.8
23	194° 11'.4	159° 17'.6	08'.2	165° 48'.8	14'.9	119° 55'.7	18'.3	336° 55'.5	52'.7
21 Sunday 00	209° 13'.9	174° 17'.1	13° 09'.3 N	180° 49'.5	11° 15'.6 N	134° 57'.6	22° 18'.3 N	351° 58'.1	11° 52'.7 S
01	224° 16'.3	189° 16'.6	10'.4	195° 50'.2	16'.3	149° 59'.6	18'.4	7° 00'.7	52'.6
02	239° 18'.8	204° 16'.0	11'.5	210° 50'.9	17'.0	165° 01'.5	18'.4	22° 03'.4	52'.6
03	254° 21'.3	219° 15'.5	12'.5	225° 51'.5	17'.6	180° 03'.4	18'.5	37° 06'.0	52'.5
04	269° 23'.7	234° 15'.0	13'.6	240° 52'.2	18'.3	195° 05'.4	18'.5	52° 08'.7	52'.4
05	284° 26'.2	249° 14'.5	14'.7	255° 52'.9	19'.0	210° 07'.3	18'.6	67° 11'.3	52'.4
06	299° 28'.7	264° 14'.0	15'.8	270° 53'.6	19'.7	225° 09'.3	18'.7	82° 14'.0	52'.3
07	314° 31'.1	279° 13'.5	16'.9	285° 54'.3	20'.3	240° 11'.2	18'.7	97° 16'.6	52'.3
08	329° 33'.6	294° 13'.0	18'.0	300° 55'.0	21'.0	255° 13'.1	18'.8	112° 19'.3	52'.2
09	344° 36'.1	309° 12'.5	19'.0	315° 55'.6	21'.7	270° 15'.1	18'.8	127° 21'.9	52'.1
10	359° 38'.5	324° 12'.0	20'.1	330° 56'.3	22'.4	285° 17'.0	18'.9	142° 24'.5	52'.1
11	14° 41'.0	339° 11'.5	21'.2	345° 57'.0	23'.1	300° 18'.9	19'.0	157° 27'.2	52'.0
12	29° 43'.5	354° 11'.0	13° 22'.3 N	0° 57'.7	11° 23'.7 N	315° 20'.9	22° 19'.0 N	172° 29'.8	11° 52'.0 S
13	44° 45'.9	9° 10'.4	23'.4	15° 58'.4	24'.4	330° 22'.8	19'.1	187° 32'.5	51'.9
14	59° 48'.4	24° 09'.9	24'.4	30° 59'.0	25'.1	345° 24'.8	19'.1	202° 35'.1	51'.8
15	74° 50'.8	39° 09'.4	25'.5	45° 59'.7	25'.8	0° 26'.7	19'.2	217° 37'.8	51'.8
16	89° 53'.3	54° 08'.9	26'.6	61° 00'.4	26'.4	15° 28'.6	19'.2	232° 40'.4	51'.7
17	104° 55'.8	69° 08'.4	27'.7	76° 01'.1	27'.1	30° 30'.6	19'.3	247° 43'.1	51'.7
18	119° 58'.2	84° 07'.9	28'.8	91° 01'.8	27'.8	45° 32'.5	19'.4	262° 45'.7	51'.6
19	135° 00'.7	99° 07'.4	29'.8	106° 02'.5	28'.5	60° 34'.4	19'.4	277° 48'.4	51'.5
20	150° 03'.2	114° 06'.9	30'.9	121° 03'.1	29'.2	75° 36'.4	19'.5	292° 51'.0	51'.5
21	165° 05'.6	129° 06'.3	32'.0	136° 03'.8	29'.8	90° 38'.3	19'.5	307° 53'.6	51'.4
22	180° 08'.1	144° 05'.8	33'.1	151° 04'.5	30'.5	105° 40'.2	19'.6	322° 56'.3	51'.4
23	195° 10'.6	159° 05'.3	34'.1	166° 05'.2	31'.2	120° 42'.2	19'.6	337° 58'.9	51'.3
	M.P. 10:01	v -0'.5	d 1'.1	v 0'.7	d 0'.7	v 1'.9	d 0'.1	v 2'.6	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.3 S
Achernar	335° 27'.5	57° 10'.2 S
Acrux	173° 08'.8	63° 10'.6 S
Adhara	255° 12'.7	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.2 N
Alkaid	152° 58'.5	49° 14'.7 N
Alnair	27° 44'.1	46° 53'.5 S
Alnilam	275° 46'.7	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.8	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.7 N
Altair	62° 08'.3	8° 54'.2 N
Ankaa	353° 16'.2	42° 14'.0 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.6	69° 02'.8 S
Avior	234° 18'.0	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.4	52° 42'.6 S
Capella	280° 34'.9	46° 00'.6 N
Deneb	49° 31'.6	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.8 S
Dubhe	193° 51'.4	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.9	51° 29'.1 N
Enif	33° 47'.4	9° 56'.1 N
Fomalhaut	15° 24'.4	29° 33'.0 S
Gacrux	172° 00'.4	57° 11'.5 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.3 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.0 N
Markab	13° 38'.7	15° 16'.6 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.4	69° 46'.8 S
Mirfak	308° 41'.0	49° 54'.4 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.5	56° 41'.2 S
Polaris	318° 16'.2	89° 19'.3 N
Pollux	243° 27'.9	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.4	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.5 S
Rigil Kent	139° 51'.1	60° 53'.4 S
Sabik	102° 12'.4	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.5 N
Shaula	96° 21'.8	37° 06'.6 S
Sirius	258° 33'.9	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.4	43° 29'.6 S
Vega	80° 38'.9	38° 47'.6 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	326° 14'.3	12:22
Mars	332° 18'.3	11:57
Jupiter	285° 56'.3	15:01
Saturn	142° 39'.9	00:36

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 12'.4	11° 09'.2 N	81° 44'.8	13'.2	14° 08'.8 N	7'.6	54'.9
195° 12'.5	10'.1	96° 17'.0	13'.1	01'.2	7'.8	55'.0
210° 12'.7	10'.9	110° 49'.1	13'.2	13° 53'.4 N	7'.8	
225° 12'.8	11'.8	125° 21'.3	13'.2	45'.6	7'.8	
240° 12'.9	12'.7	139° 53'.5	13'.2	37'.8	8'.0	
255° 13'.1	13'.5	154° 25'.7	13'.3	29'.8	8'.0	55'.1
270° 13'.2	14'.4	168° 58'.0	13'.2	21'.8	8'.1	
285° 13'.3	15'.3	183° 30'.2	13'.2	13'.7	8'.1	
300° 13'.5	16'.1	198° 02'.4	13'.3	05'.6	8'.2	
315° 13'.6	17'.0	212° 34'.7	13'.2	12° 57'.4 N	8'.3	
330° 13'.7	17'.9	227° 06'.9	13'.3	49'.1	8'.3	55'.2
345° 13'.9	18'.7	241° 39'.2	13'.2	40'.8	8'.4	
0° 14'.0	11° 19'.6 N	256° 11'.4	13'.3	12° 32'.4 N	8'.4	55'.2
15° 14'.1	20'.4	270° 43'.7	13'.2	24'.0	8'.6	
30° 14'.3	21'.3	285° 15'.9	13'.3	15'.4	8'.6	55'.3
45° 14'.4	22'.2	299° 48'.2	13'.3	06'.8	8'.6	
60° 14'.5	23'.0	314° 20'.5	13'.3	11° 58'.2 N	8'.7	
75° 14'.7	23'.9	328° 52'.8	13'.2	49'.5	8'.8	
90° 14'.8	24'.7	343° 25'.0	13'.3	40'.7	8'.8	55'.4
105° 14'.9	25'.6	357° 57'.3	13'.3	31'.9	8'.9	
120° 15'.1	26'.5	12° 29'.6	13'.3	23'.0	9'.0	
135° 15'.2	27'.3	27° 01'.9	13'.3	14'.0	9'.0	
150° 15'.3	28'.2	41° 34'.2	13'.3	05'.0	9'.1	55'.5
165° 15'.5	29'.0	56° 06'.5	13'.3	10° 55'.9 N	9'.1	
180° 15'.6	11° 29'.9 N	70° 38'.8	13'.2	10° 46'.8 N	9'.2	55'.5
195° 15'.7	30'.7	85° 11'.0	13'.3	37'.6	9'.2	55'.6
210° 15'.9	31'.6	99° 43'.3	13'.3	28'.4	9'.4	
225° 16'.0	32'.5	114° 15'.6	13'.3	19'.0	9'.3	
240° 16'.1	33'.3	128° 47'.9	13'.3	09'.7	9'.4	
255° 16'.3	34'.2	143° 20'.2	13'.2	00'.3	9'.5	55'.7
270° 16'.4	35'.0	157° 52'.4	13'.3	9° 50'.8 N	9'.5	
285° 16'.5	35'.9	172° 24'.7	13'.3	41'.3	9'.6	
300° 16'.7	36'.7	186° 57'.0	13'.2	31'.7	9'.7	55'.8
315° 16'.8	37'.6	201° 29'.2	13'.3	22'.0	9'.7	
330° 16'.9	38'.4	216° 01'.5	13'.2	12'.3	9'.7	
345° 17'.0	39'.3	230° 33'.7	13'.3	02'.6	9'.8	
0° 17'.2	11° 40'.2 N	245° 06'.0	13'.2	8° 52'.8 N	9'.8	55'.9
15° 17'.3	41'.0	259° 38'.2	13'.2	43'.0	9'.9	
30° 17'.4	41'.9	274° 10'.4	13'.2	33'.1	10'.0	
45° 17'.6	42'.7	288° 42'.6	13'.2	23'.1	10'.0	56'.0
60° 17'.7	43'.6	303° 14'.8	13'.2	13'.1	10'.0	
75° 17'.8	44'.4	317° 47'.0	13'.2	03'.1	10'.1	
90° 18'.0	45'.3	332° 19'.2	13'.2	7° 53'.0 N	10'.2	56'.1
105° 18'.1	46'.1	346° 51'.4	13'.2	42'.8	10'.2	
120° 18'.2	47'.0	1° 23'.6	13'.1	32'.6	10'.2	
135° 18'.3	47'.8	15° 55'.7	13'.1	22'.4	10'.3	56'.2
150° 18'.5	48'.7	30° 27'.8	13'.2	12'.1	10'.3	
165° 18'.6	49'.5	45° 00'.0	13'.1	01'.8	10'.4	
180° 18'.7	11° 50'.4 N	59° 32'.1	13'.1	6° 51'.4 N	10'.4	56'.3
195° 18'.8	51'.2	74° 04'.2	13'.0	41'.0	10'.5	
210° 19'.0	52'.1	88° 36'.2	13'.1	30'.5	10'.5	
225° 19'.1	52'.9	103° 08'.3	13'.0	20'.0	10'.6	56'.4
240° 19'.2	53'.8	117° 40'.3	13'.1	09'.4	10'.6	
255° 19'.4	54'.6	132° 12'.4	13'.0	5° 58'.8 N	10'.6	
270° 19'.5	55'.5	146° 44'.4	13'.0	48'.2	10'.7	56'.5
285° 19'.6	56'.3	161° 16'.4	12'.9	37'.5	10'.7	
300° 19'.7	57'.1	175° 48'.3	13'.0	26'.8	10'.8	
315° 19'.9	58'.0	190° 20'.3	12'.9	16'.0	10'.8	56'.6
330° 20'.0	58'.8	204° 52'.2	12'.9	05'.2	10'.8	
345° 20'.1	59'.7	219° 24'.1	12'.9	4° 54'.4 N	10'.9	
0° 20'.2	12° 00'.5 N	233° 56'.0	12'.8	4° 43'.5 N	10'.9	56'.7
15° 20'.4	01'.4	248° 27'.8	12'.9	32'.6	10'.9	
30° 20'.5	02'.2	262° 59'.7	12'.8	21'.7	11'.0	
45° 20'.6	03'.1	277° 31'.5	12'.8	10'.7	11'.0	56'.8
60° 20'.7	03'.9	292° 03'.3	12'.7	3° 59'.7 N	11'.0	
75° 20'.9	04'.8	306° 35'.0	12'.7	48'.7	11'.1	
90° 21'.0	05'.6	321° 06'.7	12'.7	37'.6	11'.1	56'.9
105° 21'.1	06'.4	335° 38'.4	12'.7	26'.5	11'.2	
120° 21'.2	07'.3	350° 10'.1	12'.6	15'.3	11'.1	
135° 21'.4	08'.1	4° 41'.7	12'.7	04'.2	11'.2	57'.0
150° 21'.5	09'.0	19° 13'.4	12'.5	2° 53'.0 N	11'.2	
165° 21'.6	09'.8	33° 44'.9	12'.6	41'.8	11'.3	
SD 15'.9	d 0'.9	SD	15'.0	15'.2	15'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21
N 72°	-	00:53	03:09	09:55	11:45	13:33
N 70°	-	01:56	03:30	10:20	11:59	13:40
68°	-	02:30	03:47	10:38	12:11	13:45
66°	00:46	02:54	04:00	10:53	12:20	13:49
64°	01:41	03:13	04:11	11:05	12:27	13:53
62°	02:12	03:28	04:21	11:15	12:34	13:56
60°	02:35	03:41	04:29	11:24	12:40	13:59
N 58°	02:52	03:51	04:36	11:31	12:45	14:01
56°	03:07	04:01	04:42	11:38	12:49	14:03
54°	03:19	04:09	04:47	11:44	12:53	14:05
52°	03:30	04:16	04:52	11:49	12:57	14:07
50°	03:39	04:22	04:57	11:54	13:00	14:08
45°	03:58	04:36	05:07	12:05	13:07	14:12
N 40°	04:12	04:46	05:15	12:13	13:13	14:15
35°	04:24	04:55	05:22	12:21	13:18	14:17
30°	04:34	05:03	05:28	12:27	13:23	14:19
20°	04:49	05:16	05:38	12:38	13:30	14:23
N 10°	05:01	05:26	05:47	12:48	13:37	14:26
0°	05:10	05:34	05:56	12:57	13:43	14:29
S 10°	05:18	05:42	06:04	13:07	13:50	14:33
20°	05:24	05:50	06:12	13:16	13:56	14:36
30°	05:30	05:58	06:22	13:27	14:04	14:40
35°	05:32	06:02	06:28	13:34	14:08	14:42
40°	05:35	06:06	06:34	13:41	14:13	14:44
45°	05:37	06:11	06:41	13:50	14:19	14:47
S 50°	05:39	06:17	06:50	14:00	14:26	14:50
52°	05:40	06:19	06:54	14:04	14:29	14:52
54°	05:41	06:22	06:59	14:09	14:32	14:54
56°	05:42	06:25	07:03	14:15	14:36	14:56
58°	05:42	06:28	07:09	14:21	14:40	14:58
S 60°	05:43	06:32	07:15	14:29	14:45	15:00
S 62°	05:44	06:35	07:22	14:37	14:50	15:03

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 19	Moonset 20	Moonset 21
N 72°	20:54	23:27	-	03:52	03:37	03:26
N 70°	20:31	22:09	-	03:26	03:21	03:17
68°	20:14	21:32	-	03:06	03:09	03:10
66°	20:00	21:07	23:31	02:51	02:58	03:04
64°	19:49	20:48	22:23	02:38	02:49	02:59
62°	19:39	20:32	21:50	02:27	02:42	02:55
60°	19:31	20:19	21:26	02:17	02:35	02:51
N 58°	19:24	20:08	21:08	02:09	02:29	02:47
56°	19:17	19:59	20:53	02:02	02:24	02:44
54°	19:12	19:51	20:41	01:55	02:20	02:42
52°	19:06	19:43	20:30	01:50	02:15	02:39
50°	19:02	19:37	20:20	01:44	02:12	02:37
45°	18:52	19:23	20:01	01:33	02:03	02:32
N 40°	18:44	19:12	19:46	01:23	01:56	02:28
35°	18:37	19:03	19:34	01:15	01:50	02:24
30°	18:30	18:55	19:25	01:08	01:45	02:21
20°	18:20	18:42	19:09	00:55	01:35	02:15
N 10°	18:11	18:32	18:57	00:44	01:27	02:10
0°	18:02	18:23	18:48	00:34	01:19	02:05
S 10°	17:54	18:15	18:40	00:23	01:12	02:01
20°	17:45	18:07	18:33	00:12	01:03	01:55
30°	17:35	18:00	18:28	-	00:54	01:50
35°	17:30	17:55	18:25	-	00:48	01:46
40°	17:23	17:51	18:22	-	00:42	01:42
45°	17:16	17:46	18:20	-	00:34	01:38
S 50°	17:07	17:40	18:18	-	00:25	01:32
52°	17:03	17:38	18:17	-	00:21	01:30
54°	16:58	17:35	18:16	-	00:17	01:27
56°	16:53	17:32	18:15	-	00:12	01:24
58°	16:48	17:29	18:14	-	00:06	01:21
S 60°	16:42	17:25	18:14	23:59	-	01:17
S 62°	16:35	17:21	18:13	23:52	-	01:12

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
19	0 49	0 56	11:59	19:08	06:46	9d 60%
20	1 02	1 08	11:59	19:54	07:31	10d 69%
21	1 15	1 21	11:59	20:41	08:17	11d 78%

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2013 April 22, 23, 24 (Mon, Tue, Wed)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.0		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
22 Monday 00	210° 13'.0	174° 04'.8	13° 35'.2 N	181° 05'.9	11° 31'.9 N	135° 44'.1	22° 19'.7 N	353° 01'.6	11° 51'.2 S
01	225° 15'.5	189° 04'.3	36'.3	196° 06'.6	32'.5	150° 46'.1	19'.8	8° 04'.2	51'.2
02	240° 18'.0	204° 03'.8	37'.4	211° 07'.2	33'.2	165° 48'.0	19'.8	23° 06'.9	51'.1
03	255° 20'.4	219° 03'.2	38'.4	226° 07'.9	33'.9	180° 49'.9	19'.9	38° 09'.5	51'.1
04	270° 22'.9	234° 02'.7	39'.5	241° 08'.6	34'.6	195° 51'.9	19'.9	53° 12'.2	51'.0
05	285° 25'.3	249° 02'.2	40'.6	256° 09'.3	35'.2	210° 53'.8	20'.0	68° 14'.8	50'.9
06	300° 27'.8	264° 01'.7	41'.6	271° 10'.0	35'.9	225° 55'.7	20'.1	83° 17'.5	50'.9
07	315° 30'.3	279° 01'.2	42'.7	286° 10'.6	36'.6	240° 57'.7	20'.1	98° 20'.1	50'.8
08	330° 32'.7	294° 00'.7	43'.8	301° 11'.3	37'.2	255° 59'.6	20'.2	113° 22'.8	50'.8
09	345° 35'.2	309° 00'.1	44'.8	316° 12'.0	37'.9	271° 01'.5	20'.2	128° 25'.4	50'.7
10	0° 37'.7	323° 59'.6	45'.9	331° 12'.7	38'.6	286° 03'.5	20'.3	143° 28'.0	50'.6
11	15° 40'.1	338° 59'.1	47'.0	346° 13'.4	39'.3	301° 05'.4	20'.3	158° 30'.7	50'.6
12	30° 42'.6	353° 58'.6	13° 48'.1 N	1° 14'.0	11° 39'.9 N	316° 07'.3	22° 20'.4 N	173° 33'.3	11° 50'.5 S
13	45° 45'.1	8° 58'.1	49'.1	16° 14'.7	40'.6	331° 09'.3	20'.5	188° 36'.0	50'.5
14	60° 47'.5	23° 57'.5	50'.2	31° 15'.4	41'.3	346° 11'.2	20'.5	203° 38'.6	50'.4
15	75° 50'.0	38° 57'.0	51'.2	46° 16'.1	42'.0	1° 13'.1	20'.6	218° 41'.3	50'.3
16	90° 52'.4	53° 56'.5	52'.3	61° 16'.8	42'.6	16° 15'.1	20'.6	233° 43'.9	50'.3
17	105° 54'.9	68° 56'.0	53'.4	76° 17'.5	43'.3	31° 17'.0	20'.7	248° 46'.6	50'.2
18	120° 57'.4	83° 55'.4	54'.4	91° 18'.1	44'.0	46° 18'.9	20'.8	263° 49'.2	50'.2
19	135° 59'.8	98° 54'.9	55'.5	106° 18'.8	44'.6	61° 20'.9	20'.8	278° 51'.9	50'.1
20	151° 02'.3	113° 54'.4	56'.6	121° 19'.5	45'.3	76° 22'.8	20'.9	293° 54'.5	50'.0
21	166° 04'.8	128° 53'.9	57'.6	136° 20'.2	46'.0	91° 24'.7	20'.9	308° 57'.2	50'.0
22	181° 07'.2	143° 53'.4	58'.7	151° 20'.9	46'.7	106° 26'.7	21'.0	323° 59'.8	49'.9
23	196° 09'.7	158° 52'.8	59'.7	166° 21'.5	47'.3	121° 28'.6	21'.0	339° 02'.4	49'.9
23 Tuesday 00	211° 12'.2	173° 52'.3	14° 00'.8 N	181° 22'.2	11° 48'.0 N	136° 30'.5	22° 21'.1 N	354° 05'.1	11° 49'.8 S
01	226° 14'.6	188° 51'.8	01'.9	196° 22'.9	48'.7	151° 32'.5	21'.2	9° 07'.7	49'.7
02	241° 17'.1	203° 51'.2	02'.9	211° 23'.6	49'.3	166° 34'.4	21'.2	24° 10'.4	49'.7
03	256° 19'.6	218° 50'.7	04'.0	226° 24'.3	50'.0	181° 36'.3	21'.3	39° 13'.0	49'.6
04	271° 22'.0	233° 50'.2	05'.0	241° 24'.9	50'.7	196° 38'.3	21'.3	54° 15'.7	49'.6
05	286° 24'.5	248° 49'.7	06'.1	256° 25'.6	51'.3	211° 40'.2	21'.4	69° 18'.3	49'.5
06	301° 26'.9	263° 49'.1	07'.2	271° 26'.3	52'.0	226° 42'.1	21'.4	84° 21'.0	49'.4
07	316° 29'.4	278° 48'.6	08'.2	286° 27'.0	52'.7	241° 44'.1	21'.5	99° 23'.6	49'.4
08	331° 31'.9	293° 48'.1	09'.3	301° 27'.7	53'.3	256° 46'.0	21'.6	114° 26'.3	49'.3
09	346° 34'.3	308° 47'.6	10'.3	316° 28'.3	54'.0	271° 47'.9	21'.6	129° 28'.9	49'.3
10	1° 36'.8	323° 47'.0	11'.4	331° 29'.0	54'.7	286° 49'.9	21'.7	144° 31'.6	49'.2
11	16° 39'.3	338° 46'.5	12'.4	346° 29'.7	55'.3	301° 51'.8	21'.7	159° 34'.2	49'.1
12	31° 41'.7	353° 46'.0	14° 13'.5 N	1° 30'.4	11° 56'.0 N	316° 53'.7	22° 21'.8 N	174° 36'.8	11° 49'.1 S
13	46° 44'.2	8° 45'.4	14'.5	16° 31'.1	56'.7	331° 55'.7	21'.8	189° 39'.5	49'.0
14	61° 46'.7	23° 44'.9	15'.6	31° 31'.7	57'.3	346° 57'.6	21'.9	204° 42'.1	49'.0
15	76° 49'.1	38° 44'.4	16'.6	46° 32'.4	58'.0	1° 59'.5	22'.0	219° 44'.8	48'.9
16	91° 51'.6	53° 43'.8	17'.7	61° 33'.1	58'.7	17° 01'.4	22'.0	234° 47'.4	48'.8
17	106° 54'.0	68° 43'.3	18'.7	76° 33'.8	59'.3	32° 03'.4	22'.1	249° 50'.1	48'.8
18	121° 56'.5	83° 42'.8	19'.8	91° 34'.5	12° 00'.0 N	47° 05'.3	22'.1	264° 52'.7	48'.7
19	136° 59'.0	98° 42'.2	20'.8	106° 35'.1	00'.7	62° 07'.2	22'.2	279° 55'.4	48'.7
20	152° 01'.4	113° 41'.7	21'.9	121° 35'.8	01'.3	77° 09'.2	22'.2	294° 58'.0	48'.6
21	167° 03'.9	128° 41'.2	22'.9	136° 36'.5	02'.0	92° 11'.1	22'.3	310° 00'.7	48'.5
22	182° 06'.4	143° 40'.6	24'.0	151° 37'.2	02'.7	107° 13'.0	22'.4	325° 03'.3	48'.5
23	197° 08'.8	158° 40'.1	25'.0	166° 37'.9	03'.3	122° 15'.0	22'.4	340° 06'.0	48'.4
24 Wednesday 00	212° 11'.3	173° 39'.6	14° 26'.1 N	181° 38'.5	12° 04'.0 N	137° 16'.9	22° 22'.5 N	355° 08'.6	11° 48'.3 S
01	227° 13'.8	188° 39'.0	27'.1	196° 39'.2	04'.7	152° 18'.8	22'.5	10° 11'.3	48'.3
02	242° 16'.2	203° 38'.5	28'.1	211° 39'.9	05'.3	167° 20'.7	22'.6	25° 13'.9	48'.2
03	257° 18'.7	218° 38'.0	29'.2	226° 40'.6	06'.0	182° 22'.7	22'.6	40° 16'.5	48'.2
04	272° 21'.2	233° 37'.4	30'.2	241° 41'.2	06'.7	197° 24'.6	22'.7	55° 19'.2	48'.1
05	287° 23'.6	248° 36'.9	31'.3	256° 41'.9	07'.3	212° 26'.5	22'.8	70° 21'.8	48'.0
06	302° 26'.1	263° 36'.3	32'.3	271° 42'.6	08'.0	227° 28'.5	22'.8	85° 24'.5	48'.0
07	317° 28'.5	278° 35'.8	33'.4	286° 43'.3	08'.7	242° 30'.4	22'.9	100° 27'.1	47'.9
08	332° 31'.0	293° 35'.3	34'.4	301° 44'.0	09'.3	257° 32'.3	22'.9	115° 29'.8	47'.9
09	347° 33'.5	308° 34'.7	35'.4	316° 44'.6	10'.0	272° 34'.2	23'.0	130° 32'.4	47'.8
10	2° 35'.9	323° 34'.2	36'.5	331° 45'.3	10'.6	287° 36'.2	23'.0	145° 35'.1	47'.7
11	17° 38'.4	338° 33'.6	37'.5	346° 46'.0	11'.3	302° 38'.1	23'.1	160° 37'.7	47'.7
12	32° 40'.9	353° 33'.1	14° 38'.5 N	1° 46'.7	12° 12'.0 N	317° 40'.0	22° 23'.2 N	175° 40'.4	11° 47'.6 S
13	47° 43'.3	8° 32'.6	39'.6	16° 47'.4	12'.6	332° 42'.0	23'.2	190° 43'.0	47'.6
14	62° 45'.8	23° 32'.0	40'.6	31° 48'.0	13'.3	347° 43'.9	23'.3	205° 45'.7	47'.5
15	77° 48'.3	38° 31'.5	41'.7	46° 48'.7	13'.9	2° 45'.8	23'.3	220° 48'.3	47'.4
16	92° 50'.7	53° 30'.9	42'.7	61° 49'.4	14'.6	17° 47'.7	23'.4	235° 51'.0	47'.4
17	107° 53'.2	68° 30'.4	43'.7	76° 50'.1	15'.3	32° 49'.7	23'.4	250° 53'.6	47'.3
18	122° 55'.6	83° 29'.8	44'.8	91° 50'.7	15'.9	47° 51'.6	23'.5	265° 56'.3	47'.3
19	137° 58'.1	98° 29'.3	45'.8	106° 51'.4	16'.6	62° 53'.5	23'.6	280° 58'.9	47'.2
20	153° 00'.6	113° 28'.8	46'.8	121° 52'.1	17'.3	77° 55'.4	23'.6	296° 01'.5	47'.1
21	168° 03'.0	128° 28'.2	47'.9	136° 52'.8	17'.9	92° 57'.4	23'.7	311° 04'.2	47'.1
22	183° 05'.5	143° 27'.7	48'.9	151° 53'.5	18'.6	107° 59'.3	23'.7	326° 06'.8	47'.0
23	198° 08'.0	158° 27'.1	49'.9	166° 54'.1	19'.2	123° 01'.2	23'.8	341° 09'.5	47'.0
	M.P. 09:50	v -0'.5	d 1'.1	v 0'.7	d 0'.7	v 1'.9	d 0'.1	v 2'.6	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.9	40° 15'.2 S
Achernar	335° 27'.5	57° 10'.2 S
Acrux	173° 08'.8	63° 10'.6 S
Adhara	255° 12'.7	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.2 N
Alkaid	152° 58'.5	49° 14'.8 N
Alnair	27° 44'.1	46° 53'.5 S
Alnilam	275° 46'.7	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.8	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.7 N
Altair	62° 08'.3	8° 54'.2 N
Ankaa	353° 16'.2	42° 14'.0 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.6	69° 02'.8 S
Avior	234° 18'.0	59° 33'.6 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.5	52° 42'.6 S
Capella	280° 34'.9	46° 00'.6 N
Deneb	49° 31'.6	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.8 S
Dubhe	193° 51'.4	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.9	51° 29'.1 N
Enif	33° 47'.3	9° 56'.1 N
Fomalhaut	15° 24'.3	29° 33'.0 S
Gacrux	172° 00'.4	57° 11'.5 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.3 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.0 N
Markab	13° 38'.6	15° 16'.6 N
Menkar	314° 15'.5	4° 08'.3 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.4	69° 46'.8 S
Mirfak	308° 41'.0	49° 54'.4 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.4	56° 41'.1 S
Polaris	318° 16'.5	89° 19'.3 N
Pollux	243° 27'.9	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.3	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.5 S
Rigil Kent	139° 51'.1	60° 53'.4 S
Sabik	102° 12'.4	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.5 N
Shaula	96° 21'.8	37° 06'.6 S
Sirius	258° 33'.9	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.4	43° 29'.6 S
Vega	80° 38'.8	38° 47'.6 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	322° 40'.1	12:25
Mars	330° 10'.1	11:54
Jupiter	285° 18'.4	14:52
Saturn	142° 52'.9	00:24

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 21'.7	12° 10'.6 N	48° 16'.5	12'.5	2° 30'.5 N	11'.3	57'.1
195° 21'.9	11'.5	62° 48'.0	12'.5	19'.2	11'.3	
210° 22'.0	12'.3	77° 19'.5	12'.4	07'.9	11'.3	57'.2
225° 22'.1	13'.2	91° 50'.9	12'.4	1° 56'.6 N	11'.4	
240° 22'.2	14'.0	106° 22'.3	12'.4	45'.2	11'.4	
255° 22'.3	14'.8	120° 53'.7	12'.4	33'.8	11'.4	57'.3
270° 22'.5	15'.7	135° 25'.1	12'.3	22'.4	11'.4	
285° 22'.6	16'.5	149° 56'.4	12'.2	11'.0	11'.5	
300° 22'.7	17'.4	164° 27'.6	12'.3	0° 59'.5 N	11'.4	57'.4
315° 22'.8	18'.2	178° 58'.9	12'.2	48'.1	11'.5	
330° 23'.0	19'.0	193° 30'.1	12'.1	36'.6	11'.5	
345° 23'.1	19'.9	208° 01'.2	12'.1	25'.1	11'.5	57'.5
0° 23'.2	12° 20'.7 N	222° 32'.3	12'.1	0° 13'.6 N	11'.6	57'.5
15° 23'.3	21'.5	237° 03'.4	12'.0	02'.0	11'.5	57'.6
30° 23'.4	22'.4	251° 34'.4	12'.0	0° 09'.5 S	11'.6	
45° 23'.6	23'.2	266° 05'.4	12'.0	21'.1	11'.6	
60° 23'.7	24'.1	280° 36'.4	11'.9	32'.7	11'.6	57'.7
75° 23'.8	24'.9	295° 07'.3	11'.8	44'.3	11'.6	
90° 23'.9	25'.7	309° 38'.1	11'.8	55'.9	11'.6	
105° 24'.0	26'.6	324° 08'.9	11'.8	1° 07'.5 S	11'.6	57'.8
120° 24'.2	27'.4	338° 39'.7	11'.7	19'.1	11'.7	
135° 24'.3	28'.2	353° 10'.4	11'.7	30'.8	11'.6	
150° 24'.4	29'.1	7° 41'.1	11'.6	42'.4	11'.7	57'.9
165° 24'.5	29'.9	22° 11'.7	11'.5	54'.1	11'.6	
180° 24'.6	12° 30'.7 N	36° 42'.2	11'.6	2° 05'.7 S	11'.7	58'.0
195° 24'.7	31'.6	51° 12'.8	11'.4	17'.4	11'.7	
210° 24'.9	32'.4	65° 43'.2	11'.4	29'.1	11'.6	
225° 25'.0	33'.2	80° 13'.6	11'.4	40'.7	11'.7	58'.1
240° 25'.1	34'.1	94° 44'.0	11'.3	52'.4	11'.7	
255° 25'.2	34'.9	109° 14'.3	11'.3	3° 04'.1 S	11'.6	
270° 25'.3	35'.7	123° 44'.6	11'.2	15'.7	11'.7	58'.2
285° 25'.5	36'.5	138° 14'.8	11'.1	27'.4	11'.7	
300° 25'.6	37'.4	152° 44'.9	11'.1	39'.1	11'.6	
315° 25'.7	38'.2	167° 15'.0	11'.0	50'.7	11'.7	58'.3
330° 25'.8	39'.0	181° 45'.0	11'.0	4° 02'.4 S	11'.6	
345° 25'.9	39'.9	196° 15'.0	10'.9	14'.0	11'.7	
0° 26'.0	12° 40'.7 N	210° 44'.9	10'.9	4° 25'.7 S	11'.6	58'.4
15° 26'.2	41'.5	225° 14'.8	10'.8	37'.3	11'.6	
30° 26'.3	42'.3	239° 44'.6	10'.7	48'.9	11'.6	58'.5
45° 26'.4	43'.2	254° 14'.3	10'.7	5° 00'.5 S	11'.6	
60° 26'.5	44'.0	268° 44'.0	10'.6	12'.1	11'.6	
75° 26'.6	44'.8	283° 13'.6	10'.6	23'.7	11'.6	58'.6
90° 26'.7	45'.7	297° 43'.2	10'.5	35'.3	11'.5	
105° 26'.8	46'.5	312° 12'.7	10'.4	46'.8	11'.6	
120° 27'.0	47'.3	326° 42'.1	10'.4	58'.4	11'.5	58'.7
135° 27'.1	48'.1	341° 11'.5	10'.3	6° 09'.9 S	11'.5	
150° 27'.2	49'.0	355° 40'.8	10'.2	21'.4	11'.4	
165° 27'.3	49'.8	10° 10'.0	10'.2	32'.8	11'.5	58'.8
180° 27'.4	12° 50'.6 N	24° 39'.2	10'.1	6° 44'.3 S	11'.4	58'.8
195° 27'.5	51'.4	39° 08'.3	10'.0	55'.7	11'.4	
210° 27'.6	52'.2	53° 37'.3	10'.0	7° 07'.1 S	11'.4	58'.9
225° 27'.8	53'.1	68° 06'.3	9'.9	18'.5	11'.3	
240° 27'.9	53'.9	82° 35'.2	9'.8	29'.8	11'.3	
255° 28'.0	54'.7	97° 04'.0	9'.8	41'.1	11'.3	59'.0
270° 28'.1	55'.5	111° 32'.8	9'.7	52'.4	11'.3	
285° 28'.2	56'.4	126° 01'.5	9'.6	8° 03'.7 S	11'.2	
300° 28'.3	57'.2	140° 30'.1	9'.6	14'.9	11'.2	59'.1
315° 28'.4	58'.0	154° 58'.7	9'.4	26'.1	11'.1	
330° 28'.5	58'.8	169° 27'.1	9'.5	37'.2	11'.1	
345° 28'.7	59'.6	183° 55'.6	9'.3	48'.3	11'.1	59'.2
0° 28'.8	13° 00'.5 N	198° 23'.9	9'.3	8° 59'.4 S	11'.1	59'.2
15° 28'.9	01'.3	212° 52'.2	9'.2	9° 10'.5 S	10'.9	
30° 29'.0	02'.1	227° 20'.4	9'.1	21'.4	11'.0	
45° 29'.1	02'.9	241° 48'.5	9'.1	32'.4	10'.9	59'.3
60° 29'.2	03'.7	256° 16'.6	8'.9	43'.3	10'.8	
75° 29'.3	04'.6	270° 44'.5	8'.9	54'.1	10'.9	
90° 29'.4	05'.4	285° 12'.4	8'.9	10° 05'.0 S	10'.7	59'.4
105° 29'.5	06'.2	299° 40'.3	8'.7	15'.7	10'.7	
120° 29'.7	07'.0	314° 08'.0	8'.7	26'.4	10'.7	
135° 29'.8	07'.8	328° 35'.7	8'.6	37'.1	10'.6	59'.5
150° 29'.9	08'.6	343° 03'.3	8'.5	47'.7	10'.5	
165° 30'.0	09'.4	357° 30'.8	8'.5	58'.2	10'.5	
SD 15'.9	d 0'.8	SD	15'.7	15'.9	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 22	Moonrise 23	Moonrise 24
N 72°	-	-	02:50	15:23	17:18	19:21
N 70°	-	01:28	03:14	15:23	17:10	19:03
68°	-	02:11	03:33	15:22	17:03	18:49
66°	-	02:39	03:48	15:21	16:57	18:37
64°	01:17	03:00	04:01	15:21	16:53	18:28
62°	01:56	03:17	04:11	15:21	16:49	18:20
60°	02:21	03:31	04:20	15:20	16:45	18:13
N 58°	02:41	03:42	04:28	15:20	16:42	18:07
56°	02:57	03:52	04:35	15:20	16:39	18:02
54°	03:10	04:01	04:41	15:19	16:37	17:57
52°	03:22	04:09	04:46	15:19	16:35	17:52
50°	03:32	04:16	04:51	15:19	16:32	17:49
45°	03:52	04:30	05:02	15:19	16:28	17:40
N 40°	04:07	04:42	05:11	15:18	16:24	17:33
35°	04:20	04:52	05:18	15:18	16:21	17:27
30°	04:30	05:00	05:25	15:18	16:19	17:22
20°	04:47	05:13	05:36	15:17	16:14	17:13
N 10°	04:59	05:24	05:46	15:17	16:10	17:05
0°	05:09	05:34	05:55	15:17	16:06	16:58
S 10°	05:18	05:42	06:04	15:16	16:02	16:50
20°	05:25	05:51	06:13	15:16	15:58	16:43
30°	05:31	06:00	06:24	15:16	15:54	16:34
35°	05:35	06:04	06:30	15:16	15:51	16:29
40°	05:38	06:09	06:37	15:15	15:48	16:23
45°	05:40	06:15	06:45	15:15	15:45	16:17
S 50°	05:43	06:21	06:55	15:15	15:41	16:09
52°	05:45	06:24	06:59	15:15	15:39	16:05
54°	05:46	06:27	07:04	15:15	15:37	16:01
56°	05:47	06:30	07:09	15:15	15:35	15:57
58°	05:48	06:34	07:15	15:15	15:32	15:52
S 60°	05:49	06:38	07:22	15:14	15:30	15:47
S 62°	05:51	06:43	07:30	15:14	15:27	15:41

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 22	Moonset 23	Moonset 24
N 72°	21:12	-	-	03:15	03:04	02:53
N 70°	20:46	22:38	-	03:12	03:08	03:03
68°	20:26	21:51	-	03:11	03:11	03:12
66°	20:11	21:21	-	03:09	03:14	03:19
64°	19:58	20:59	22:48	03:07	03:16	03:25
62°	19:47	20:42	22:06	03:06	03:18	03:31
60°	19:38	20:28	21:39	03:05	03:20	03:35
N 58°	19:30	20:16	21:18	03:04	03:21	03:40
56°	19:23	20:06	21:02	03:03	03:22	03:43
54°	19:17	19:57	20:48	03:02	03:24	03:47
52°	19:12	19:49	20:36	03:02	03:25	03:50
50°	19:06	19:42	20:26	03:01	03:26	03:52
45°	18:56	19:27	20:06	03:00	03:28	03:59
N 40°	18:47	19:15	19:50	02:58	03:30	04:04
35°	18:39	19:06	19:37	02:57	03:32	04:08
30°	18:32	18:57	19:27	02:56	03:33	04:12
20°	18:21	18:44	19:10	02:55	03:36	04:19
N 10°	18:11	18:32	18:58	02:53	03:38	04:25
0°	18:02	18:23	18:47	02:52	03:40	04:30
S 10°	17:53	18:14	18:39	02:50	03:42	04:36
20°	17:43	18:05	18:31	02:49	03:44	04:42
30°	17:32	17:57	18:25	02:47	03:47	04:48
35°	17:26	17:52	18:22	02:46	03:48	04:52
40°	17:19	17:47	18:18	02:45	03:50	04:57
45°	17:11	17:41	18:15	02:43	03:51	05:02
S 50°	17:01	17:35	18:12	02:42	03:54	05:08
52°	16:57	17:32	18:11	02:41	03:55	05:11
54°	16:52	17:29	18:10	02:40	03:56	05:14
56°	16:46	17:25	18:09	02:39	03:57	05:18
58°	16:40	17:21	18:07	02:38	03:58	05:22
S 60°	16:33	17:17	18:06	02:37	04:00	05:26
S 62°	16:26	17:13	18:05	02:36	04:02	05:31

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
22	1 27	1 33	11:58	21:28	09:04	12d 86%
23	1 38	1 44	11:58	22:18	09:53	13d 93%
24	1 49	1 55	11:58	23:10	10:44	14d 98%

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2013 April 25, 26, 27 (Thur, Fri, Sat)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.0		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
25 Thursday 00	213° 10'.4	173° 26'.6	14° 51'.0 N	181° 54'.8	12° 19'.9 N	138° 03'.1	22° 23'.8 N	356° 12'.1	11° 46'.9 S
01	228° 12'.9	188° 26'.0	52'.0	196° 55'.5	20'.5	153° 05'.1	23'.9	11° 14'.8	46'.8
02	243° 15'.4	203° 25'.5	53'.0	211° 56'.2	21'.2	168° 07'.0	24'.0	26° 17'.4	46'.8
03	258° 17'.8	218° 24'.9	54'.0	226° 56'.8	21'.9	183° 08'.9	24'.0	41° 20'.1	46'.7
04	273° 20'.3	233° 24'.4	55'.1	241° 57'.5	22'.5	198° 10'.8	24'.1	56° 22'.7	46'.7
05	288° 22'.8	248° 23'.8	56'.1	256° 58'.2	23'.2	213° 12'.8	24'.1	71° 25'.4	46'.6
06	303° 25'.2	263° 23'.3	57'.1	271° 58'.9	23'.8	228° 14'.7	24'.2	86° 28'.0	46'.5
07	318° 27'.7	278° 22'.7	58'.1	286° 59'.5	24'.5	243° 16'.6	24'.2	101° 30'.7	46'.5
08	333° 30'.1	293° 22'.2	59'.2	302° 00'.2	25'.2	258° 18'.5	24'.3	116° 33'.3	46'.4
09	348° 32'.6	308° 21'.6	15° 00'.2 N	317° 00'.9	25'.8	273° 20'.5	24'.3	131° 36'.0	46'.4
10	3° 35'.1	323° 21'.1	01'.2	332° 01'.6	26'.5	288° 22'.4	24'.4	146° 38'.6	46'.3
11	18° 37'.5	338° 20'.5	02'.2	347° 02'.3	27'.1	303° 24'.3	24'.5	161° 41'.3	46'.2
12	33° 40'.0	353° 20'.0	15° 03'.3 N	2° 02'.9	12° 27'.8 N	318° 26'.2	22° 24'.5 N	176° 43'.9	11° 46'.2 S
13	48° 42'.5	8° 19'.4	04'.3	17° 03'.6	28'.4	333° 28'.2	24'.6	191° 46'.5	46'.1
14	63° 44'.9	23° 18'.9	05'.3	32° 04'.3	29'.1	348° 30'.1	24'.6	206° 49'.2	46'.1
15	78° 47'.4	38° 18'.3	06'.3	47° 05'.0	29'.7	3° 32'.0	24'.7	221° 51'.8	46'.0
16	93° 49'.9	53° 17'.8	07'.3	62° 05'.6	30'.4	18° 33'.9	24'.7	236° 54'.5	45'.9
17	108° 52'.3	68° 17'.2	08'.4	77° 06'.3	31'.1	33° 35'.9	24'.8	251° 57'.1	45'.9
18	123° 54'.8	83° 16'.7	09'.4	92° 07'.0	31'.7	48° 37'.8	24'.9	266° 59'.8	45'.8
19	138° 57'.3	98° 16'.1	10'.4	107° 07'.7	32'.4	63° 39'.7	24'.9	282° 02'.4	45'.8
20	153° 59'.7	113° 15'.6	11'.4	122° 08'.3	33'.0	78° 41'.6	25'.0	297° 05'.1	45'.7
21	169° 02'.2	128° 15'.0	12'.4	137° 09'.0	33'.7	93° 43'.6	25'.0	312° 07'.7	45'.6
22	184° 04'.6	143° 14'.4	13'.4	152° 09'.7	34'.3	108° 45'.5	25'.1	327° 10'.4	45'.6
23	199° 07'.1	158° 13'.9	14'.5	167° 10'.4	35'.0	123° 47'.4	25'.1	342° 13'.0	45'.5
26 Friday 00	214° 09'.6	173° 13'.3	15° 15'.5 N	182° 11'.0	12° 35'.6 N	138° 49'.3	22° 25'.2 N	357° 15'.7	11° 45'.5 S
01	229° 12'.0	188° 12'.8	16'.5	197° 11'.7	36'.3	153° 51'.3	25'.3	12° 18'.3	45'.4
02	244° 14'.5	203° 12'.2	17'.5	212° 12'.4	36'.9	168° 53'.2	25'.3	27° 21'.0	45'.3
03	259° 17'.0	218° 11'.7	18'.5	227° 13'.1	37'.6	183° 55'.1	25'.4	42° 23'.6	45'.3
04	274° 19'.4	233° 11'.1	19'.5	242° 13'.7	38'.3	198° 57'.0	25'.4	57° 26'.3	45'.2
05	289° 21'.9	248° 10'.5	20'.5	257° 14'.4	38'.9	213° 58'.9	25'.5	72° 28'.9	45'.2
06	304° 24'.4	263° 10'.0	21'.5	272° 15'.1	39'.6	229° 00'.9	25'.5	87° 31'.6	45'.1
07	319° 26'.8	278° 09'.4	22'.6	287° 15'.8	40'.2	244° 02'.8	25'.6	102° 34'.2	45'.0
08	334° 29'.3	293° 08'.9	23'.6	302° 16'.5	40'.9	259° 04'.7	25'.6	117° 36'.9	45'.0
09	349° 31'.7	308° 08'.3	24'.6	317° 17'.1	41'.5	274° 06'.6	25'.7	132° 39'.5	44'.9
10	4° 34'.2	323° 07'.7	25'.6	332° 17'.8	42'.2	289° 08'.6	25'.8	147° 42'.1	44'.9
11	19° 36'.7	338° 07'.2	26'.6	347° 18'.5	42'.8	304° 10'.5	25'.8	162° 44'.8	44'.8
12	34° 39'.1	353° 06'.6	15° 27'.6 N	2° 19'.2	12° 43'.5 N	319° 12'.4	22° 25'.9 N	177° 47'.4	11° 44'.7 S
13	49° 41'.6	8° 06'.1	28'.6	17° 19'.8	44'.1	334° 14'.3	25'.9	192° 50'.1	44'.7
14	64° 44'.1	23° 05'.5	29'.6	32° 20'.5	44'.8	349° 16'.2	26'.0	207° 52'.7	44'.6
15	79° 46'.5	38° 04'.9	30'.6	47° 21'.2	45'.4	4° 18'.2	26'.0	222° 55'.4	44'.6
16	94° 49'.0	53° 04'.4	31'.6	62° 21'.9	46'.1	19° 20'.1	26'.1	237° 58'.0	44'.5
17	109° 51'.5	68° 03'.8	32'.6	77° 22'.5	46'.7	34° 22'.0	26'.1	253° 00'.7	44'.4
18	124° 53'.9	83° 03'.2	33'.6	92° 23'.2	47'.4	49° 23'.9	26'.2	268° 03'.3	44'.4
19	139° 56'.4	98° 02'.7	34'.6	107° 23'.9	48'.0	64° 25'.8	26'.3	283° 06'.0	44'.3
20	154° 58'.9	113° 02'.1	35'.6	122° 24'.5	48'.7	79° 27'.8	26'.3	298° 08'.6	44'.3
21	170° 01'.3	128° 01'.5	36'.6	137° 25'.2	49'.3	94° 29'.7	26'.4	313° 11'.3	44'.2
22	185° 03'.8	143° 01'.0	37'.6	152° 25'.9	50'.0	109° 31'.6	26'.4	328° 13'.9	44'.1
23	200° 06'.2	158° 00'.4	38'.6	167° 26'.6	50'.6	124° 33'.5	26'.5	343° 16'.6	44'.1
27 Saturday 00	215° 08'.7	172° 59'.8	15° 39'.6 N	182° 27'.2	12° 51'.3 N	139° 35'.4	22° 26'.5 N	358° 19'.2	11° 44'.0 S
01	230° 11'.2	187° 59'.3	40'.6	197° 27'.9	51'.9	154° 37'.4	26'.6	13° 21'.9	44'.0
02	245° 13'.6	202° 58'.7	41'.6	212° 28'.6	52'.6	169° 39'.3	26'.6	28° 24'.5	43'.9
03	260° 16'.1	217° 58'.1	42'.6	227° 29'.3	53'.2	184° 41'.2	26'.7	43° 27'.2	43'.8
04	275° 18'.6	232° 57'.6	43'.6	242° 29'.9	53'.9	199° 43'.1	26'.8	58° 29'.8	43'.8
05	290° 21'.0	247° 57'.0	44'.6	257° 30'.6	54'.5	214° 45'.0	26'.8	73° 32'.5	43'.7
06	305° 23'.5	262° 56'.4	45'.6	272° 31'.3	55'.1	229° 47'.0	26'.9	88° 35'.1	43'.7
07	320° 26'.0	277° 55'.9	46'.6	287° 32'.0	55'.8	244° 48'.9	26'.9	103° 37'.7	43'.6
08	335° 28'.4	292° 55'.3	47'.6	302° 32'.6	56'.4	259° 50'.8	27'.0	118° 40'.4	43'.5
09	350° 30'.9	307° 54'.7	48'.6	317° 33'.3	57'.1	274° 52'.7	27'.0	133° 43'.0	43'.5
10	5° 33'.4	322° 54'.1	49'.6	332° 34'.0	57'.7	289° 54'.6	27'.1	148° 45'.7	43'.4
11	20° 35'.8	337° 53'.6	50'.6	347° 34'.7	58'.4	304° 56'.5	27'.1	163° 48'.3	43'.4
12	35° 38'.3	352° 53'.0	15° 51'.5 N	2° 35'.3	12° 59'.0 N	319° 58'.5	22° 27'.2 N	178° 51'.0	11° 43'.3 S
13	50° 40'.7	7° 52'.4	52'.5	17° 36'.0	59'.7	335° 00'.4	27'.3	193° 53'.6	43'.2
14	65° 43'.2	22° 51'.8	53'.5	32° 36'.7	13° 00'.3 N	350° 02'.3	27'.3	208° 56'.3	43'.2
15	80° 45'.7	37° 51'.3	54'.5	47° 37'.3	01'.0	5° 04'.2	27'.4	223° 58'.9	43'.1
16	95° 48'.1	52° 50'.7	55'.5	62° 38'.0	01'.6	20° 06'.1	27'.4	239° 01'.6	43'.1
17	110° 50'.6	67° 50'.1	56'.5	77° 38'.7	02'.2	35° 08'.1	27'.5	254° 04'.2	43'.0
18	125° 53'.1	82° 49'.5	57'.5	92° 39'.4	02'.9	50° 10'.0	27'.5	269° 06'.9	42'.9
19	140° 55'.5	97° 49'.0	58'.5	107° 40'.0	03'.5	65° 11'.9	27'.6	284° 09'.5	42'.9
20	155° 58'.0	112° 48'.4	59'.4	122° 40'.7	04'.2	80° 13'.8	27'.6	299° 12'.2	42'.8
21	171° 00'.5	127° 47'.8	16° 00'.4 N	137° 41'.4	04'.8	95° 15'.7	27'.7	314° 14'.8	42'.8
22	186° 02'.9	142° 47'.2	01'.4	152° 42'.1	05'.5	110° 17'.6	27'.8	329° 17'.5	42'.7
23	201° 05'.4	157° 46'.7	02'.4	167° 42'.7	06'.1	125° 19'.6	27'.8	344° 20'.1	42'.6
	M.P. 09:38	v -0'.6	d 1'.0	v 0'.7	d 0'.7	v 1'.9	d 0'.1	v 2'.6	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.9	40° 15'.2 S
Achernar	335° 27'.5	57° 10'.1 S
Acrux	173° 08'.8	63° 10'.6 S
Adhara	255° 12'.8	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.3 N
Alkaid	152° 58'.5	49° 14'.8 N
Alnair	27° 44'.1	46° 53'.5 S
Alnilam	275° 46'.7	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.8	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.7 N
Altair	62° 08'.3	8° 54'.2 N
Ankaa	353° 16'.2	42° 13'.9 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.5	69° 02'.8 S
Avior	234° 18'.1	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.5	52° 42'.6 S
Capella	280° 34'.9	46° 00'.6 N
Deneb	49° 31'.5	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.8 S
Dubhe	193° 51'.5	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.9	51° 29'.1 N
Enif	33° 47'.3	9° 56'.2 N
Fomalhaut	15° 24'.3	29° 33'.0 S
Gacrux	172° 00'.5	57° 11'.5 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.3 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.0 N
Markab	13° 38'.6	15° 16'.6 N
Menkar	314° 15'.5	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.5	69° 46'.8 S
Mirfak	308° 41'.0	49° 54'.4 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.4	56° 41'.1 S
Polaris	318° 16'.4	89° 19'.3 N
Pollux	243° 27'.9	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.3	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.5 S
Rigil Kent	139° 51'.1	60° 53'.4 S
Sabik	102° 12'.4	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.5 N
Shaula	96° 21'.8	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.4	43° 29'.6 S
Vega	80° 38'.8	38° 47'.7 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	319° 03'.8	12:28
Mars	328° 01'.5	11:51
Jupiter	284° 39'.8	14:43
Saturn	143° 06'.1	00:11

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 30'.1	13° 10'.3 N	11° 58'.3	8'.4	11° 08'.7 S	10'.5	59'.5
195° 30'.2	11'.1	26° 25'.7	8'.3	19'.2	10'.3	59'.6
210° 30'.3	11'.9	40° 53'.0	8'.2	29'.5	10'.4	
225° 30'.4	12'.7	55° 20'.2	8'.2	39'.9	10'.2	
240° 30'.5	13'.5	69° 47'.4	8'.0	50'.1	10'.2	
255° 30'.6	14'.3	84° 14'.4	8'.0	12° 00'.3 S	10'.1	59'.7
270° 30'.7	15'.1	98° 41'.4	8'.0	10'.4	10'.1	
285° 30'.8	16'.0	113° 08'.4	7'.8	20'.5	10'.0	
300° 31'.0	16'.8	127° 35'.2	7'.8	30'.5	9'.9	
315° 31'.1	17'.6	142° 02'.0	7'.7	40'.4	9'.8	59'.8
330° 31'.2	18'.4	156° 28'.7	7'.6	50'.2	9'.8	
345° 31'.3	19'.2	170° 55'.3	7'.5	00'.0	9'.7	
0° 31'.4	13° 20'.0 N	185° 21'.8	7'.5	13° 09'.7 S	9'.6	59'.8
15° 31'.5	20'.8	199° 48'.3	7'.4	19'.3	9'.6	59'.9
30° 31'.6	21'.6	214° 14'.7	7'.3	28'.9	9'.4	
45° 31'.7	22'.4	228° 41'.0	7'.2	38'.3	9'.4	
60° 31'.8	23'.3	243° 07'.2	7'.2	47'.7	9'.3	
75° 31'.9	24'.1	257° 33'.4	7'.1	57'.0	9'.3	60'.0
90° 32'.0	24'.9	271° 59'.5	7'.0	14° 06'.3 S	9'.1	
105° 32'.1	25'.7	286° 25'.5	6'.9	15'.4	9'.0	
120° 32'.2	26'.5	300° 51'.4	6'.9	24'.4	9'.0	
135° 32'.3	27'.3	315° 17'.3	6'.8	33'.4	8'.9	
150° 32'.4	28'.1	329° 43'.1	6'.7	42'.3	8'.8	60'.1
165° 32'.5	28'.9	344° 08'.8	6'.6	51'.1	8'.7	
180° 32'.6	13° 29'.7 N	358° 34'.4	6'.6	14° 59'.8 S	8'.6	60'.1
195° 32'.7	30'.5	13° 00'.0	6'.5	15° 08'.4 S	8'.5	
210° 32'.9	31'.3	27° 25'.5	6'.4	16'.9	8'.4	
225° 33'.0	32'.1	41° 50'.9	6'.4	25'.3	8'.3	60'.2
240° 33'.1	32'.9	56° 16'.3	6'.3	33'.6	8'.2	
255° 33'.2	33'.7	70° 41'.6	6'.2	41'.8	8'.1	
270° 33'.3	34'.5	85° 06'.8	6'.1	49'.9	8'.0	
285° 33'.4	35'.3	99° 31'.9	6'.1	57'.9	7'.9	
300° 33'.5	36'.1	113° 57'.0	6'.0	16° 05'.8 S	7'.8	
315° 33'.6	36'.9	128° 22'.0	5'.9	13'.6	7'.7	60'.3
330° 33'.7	37'.7	142° 46'.9	5'.9	21'.3	7'.6	
345° 33'.8	38'.5	157° 11'.8	5'.8	28'.9	7'.5	
0° 33'.9	13° 39'.3 N	171° 36'.6	5'.7	16° 36'.4 S	7'.4	60'.3
15° 34'.0	40'.1	186° 01'.3	5'.7	43'.8	7'.2	
30° 34'.1	41'.0	200° 26'.0	5'.6	51'.0	7'.2	
45° 34'.2	41'.8	214° 50'.6	5'.6	58'.2	7'.0	
60° 34'.3	42'.5	229° 15'.2	5'.4	17° 05'.2 S	6'.9	60'.4
75° 34'.4	43'.3	243° 39'.6	5'.5	12'.1	6'.8	
90° 34'.5	44'.1	258° 04'.1	5'.3	18'.9	6'.7	
105° 34'.6	44'.9	272° 28'.4	5'.3	25'.6	6'.6	
120° 34'.7	45'.7	286° 52'.7	5'.3	32'.2	6'.4	
135° 34'.8	46'.5	301° 17'.0	5'.2	38'.6	6'.3	
150° 34'.9	47'.3	315° 41'.2	5'.1	44'.9	6'.2	
165° 35'.0	48'.1	330° 05'.3	5'.1	51'.1	6'.1	
180° 35'.1	13° 48'.9 N	344° 29'.4	5'.0	17° 57'.2 S	6'.0	60'.4
195° 35'.2	49'.7	358° 53'.4	5'.0	18° 03'.2 S	5'.8	
210° 35'.3	50'.5	13° 17'.4	4'.9	09'.0	5'.7	60'.5
225° 35'.4	51'.3	27° 41'.3	4'.9	14'.7	5'.6	
240° 35'.5	52'.1	42° 05'.2	4'.8	20'.3	5'.4	
255° 35'.6	52'.9	56° 29'.0	4'.8	25'.7	5'.3	
270° 35'.7	53'.7	70° 52'.8	4'.7	31'.0	5'.2	
285° 35'.8	54'.5	85° 16'.5	4'.7	36'.2	5'.1	
300° 35'.9	55'.3	99° 40'.2	4'.7	41'.3	4'.9	
315° 36'.0	56'.1	114° 03'.9	4'.6	46'.2	4'.8	
330° 36'.1	56'.9	128° 27'.5	4'.5	51'.0	4'.6	
345° 36'.1	57'.7	142° 51'.0	4'.6	55'.6	4'.6	
0° 36'.2	13° 58'.5 N	157° 14'.6	4'.4	19° 00'.2 S	4'.4	60'.5
15° 36'.3	59'.3	171° 38'.0	4'.5	04'.6	4'.2	
30° 36'.4	14° 00'.0 N	186° 01'.5	4'.4	08'.8	4'.1	
45° 36'.5	00'.8	200° 24'.9	4'.4	12'.9	4'.0	
60° 36'.6	01'.6	214° 48'.3	4'.3	16'.9	3'.8	
75° 36'.7	02'.4	229° 11'.6	4'.4	20'.7	3'.7	
90° 36'.8	03'.2	243° 35'.0	4'.3	24'.4	3'.6	
105° 36'.9	04'.0	257° 58'.3	4'.2	28'.0	3'.4	
120° 37'.0	04'.8	272° 21'.5	4'.3	31'.4	3'.3	
135° 37'.1	05'.6	286° 44'.8	4'.2	34'.7	3'.1	
150° 37'.2	06'.4	301° 08'.0	4'.2	37'.8	3'.0	
165° 37'.3	07'.1	315° 31'.2	4'.2	40'.8	2'.8	
SD 15'.9	d 0'.8	SD 16'.3		16'.4	16'.5	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 25	Moonrise 26	Moonrise 27
N 72°	-	-	02:29	21:38	-	-
N 70°	-	00:50	02:58	21:04	23:14	25:54
68°	-	01:50	03:20	20:40	22:32	24:16
66°	-	02:23	03:37	20:21	22:04	23:37
64°	00:44	02:47	03:50	20:06	21:42	23:09
62°	01:37	03:06	04:02	19:53	21:25	22:48
60°	02:07	03:21	04:11	19:43	21:11	22:31
N 58°	02:30	03:34	04:20	19:34	20:59	22:17
56°	02:47	03:44	04:27	19:26	20:48	22:05
54°	03:02	03:54	04:34	19:18	20:39	21:54
52°	03:14	04:02	04:40	19:12	20:31	21:45
50°	03:25	04:10	04:45	19:06	20:23	21:36
45°	03:46	04:25	04:57	18:54	20:08	21:18
N 40°	04:03	04:38	05:06	18:44	19:55	21:04
35°	04:16	04:48	05:15	18:35	19:44	20:51
30°	04:27	04:57	05:22	18:27	19:34	20:40
20°	04:44	05:11	05:34	18:14	19:18	20:22
N 10°	04:58	05:23	05:45	18:03	19:04	20:06
0°	05:08	05:33	05:54	17:52	18:50	19:51
S 10°	05:18	05:43	06:04	17:42	18:37	19:36
20°	05:26	05:52	06:14	17:31	18:23	19:20
30°	05:33	06:01	06:26	17:18	18:07	19:02
35°	05:37	06:06	06:33	17:11	17:58	18:51
40°	05:40	06:12	06:40	17:03	17:48	18:39
45°	05:44	06:18	06:49	16:53	17:35	18:25
S 50°	05:47	06:25	06:59	16:42	17:21	18:08
52°	05:49	06:29	07:04	16:36	17:14	18:00
54°	05:51	06:32	07:09	16:30	17:06	17:51
56°	05:52	06:36	07:15	16:24	16:57	17:41
58°	05:54	06:40	07:22	16:17	16:48	17:29
S 60°	05:56	06:45	07:29	16:08	16:37	17:16
S 62°	05:57	06:50	07:38	15:59	16:24	17:00

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 25	Moonset 26	Moonset 27
N 72°	21:32	-	-	02:38	02:17	-
N 70°	21:01	23:25	-	02:58	02:52	02:45
68°	20:39	22:12	-	03:14	03:18	03:28
66°	20:22	21:36	-	03:27	03:38	03:57
64°	20:07	21:11	23:29	03:37	03:54	04:19
62°	19:56	20:52	22:24	03:46	04:07	04:36
60°	19:46	20:37	21:52	03:54	04:18	04:51
N 58°	19:37	20:24	21:29	04:01	04:28	05:04
56°	19:29	20:13	21:11	04:07	04:37	05:15
54°	19:23	20:03	20:56	04:13	04:45	05:24
52°	19:17	19:55	20:43	04:18	04:52	05:33
50°	19:11	19:47	20:32	04:22	04:58	05:41
45°	18:59	19:31	20:11	04:32	05:11	05:57
N 40°	18:50	19:19	19:54	04:41	05:22	06:11
35°	18:41	19:08	19:40	04:48	05:32	06:22
30°	18:34	18:59	19:29	04:54	05:40	06:32
20°	18:22	18:45	19:12	05:05	05:55	06:50
N 10°	18:11	18:33	18:58	05:14	06:08	07:05
0°	18:01	18:22	18:47	05:23	06:20	07:19
S 10°	17:51	18:13	18:38	05:32	06:32	07:33
20°	17:41	18:04	18:30	05:42	06:44	07:48
30°	17:29	17:54	18:22	05:53	06:59	08:06
35°	17:23	17:49	18:18	05:59	07:08	08:16
40°	17:15	17:43	18:15	06:06	07:17	08:28
45°	17:06	17:37	18:11	06:15	07:29	08:41
S 50°	16:56	17:29	18:07	06:25	07:43	08:58
52°	16:51	17:26	18:06	06:30	07:49	09:06
54°	16:45	17:22	18:04	06:35	07:56	09:15
56°	16:39	17:19	18:02	06:41	08:04	09:25
58°	16:33	17:14	18:01	06:47	08:14	09:36
S 60°	16:25	17:10	17:59	06:55	08:24	09:49
S 62°	16:17	17:05	17:57	07:03	08:36	10:04

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
25	2 00	2 05	11:58	24:06	11:38	15d Full
26	2 10	2 15	11:58	00:06	12:35	16d 99%
27	2 20	2 25	11:58	01:05	13:35	17d 96%

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2013 April 28, 29, 30 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.2		JUPITER -2.0		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
28 Sunday 00	216° 07'.9	172° 46'.1	16° 03'.4 N	182° 43'.4	13° 06'.7 N	140° 21'.5	22° 27'.9 N	359° 22'.8	11° 42'.6 S
01	231° 10'.3	187° 45'.5	04'.4	197° 44'.1	07'.4	155° 23'.4	27'.9	14° 25'.4	42'.5
02	246° 12'.8	202° 44'.9	05'.3	212° 44'.7	08'.0	170° 25'.3	28'.0	29° 28'.1	42'.5
03	261° 15'.2	217° 44'.3	06'.3	227° 45'.4	08'.7	185° 27'.2	28'.0	44° 30'.7	42'.4
04	276° 17'.7	232° 43'.8	07'.3	242° 46'.1	09'.3	200° 29'.1	28'.1	59° 33'.4	42'.3
05	291° 20'.2	247° 43'.2	08'.3	257° 46'.8	10'.0	215° 31'.1	28'.1	74° 36'.0	42'.3
06	306° 22'.6	262° 42'.6	09'.2	272° 47'.4	10'.6	230° 33'.0	28'.2	89° 38'.6	42'.2
07	321° 25'.1	277° 42'.0	10'.2	287° 48'.1	11'.2	245° 34'.9	28'.3	104° 41'.3	42'.2
08	336° 27'.6	292° 41'.4	11'.2	302° 48'.8	11'.9	260° 36'.8	28'.3	119° 43'.9	42'.1
09	351° 30'.0	307° 40'.8	12'.2	317° 49'.4	12'.5	275° 38'.7	28'.4	134° 46'.6	42'.0
10	6° 32'.5	322° 40'.3	13'.2	332° 50'.1	13'.2	290° 40'.6	28'.4	149° 49'.2	42'.0
11	21° 35'.0	337° 39'.7	14'.1	347° 50'.8	13'.8	305° 42'.5	28'.5	164° 51'.9	41'.9
12	36° 37'.4	352° 39'.1	16° 15'.1 N	2° 51'.5	13° 14'.4 N	320° 44'.5	22° 28'.5 N	179° 54'.5	11° 41'.9 S
13	51° 39'.9	7° 38'.5	16'.1	17° 52'.1	15'.1	335° 46'.4	28'.6	194° 57'.2	41'.8
14	66° 42'.3	22° 37'.9	17'.0	32° 52'.8	15'.7	350° 48'.3	28'.6	209° 59'.8	41'.7
15	81° 44'.8	37° 37'.3	18'.0	47° 53'.5	16'.4	5° 50'.2	28'.7	225° 02'.5	41'.7
16	96° 47'.3	52° 36'.8	19'.0	62° 54'.1	17'.0	20° 52'.1	28'.7	240° 05'.1	41'.6
17	111° 49'.7	67° 36'.2	20'.0	77° 54'.8	17'.6	35° 54'.0	28'.8	255° 07'.8	41'.6
18	126° 52'.2	82° 35'.6	20'.9	92° 55'.5	18'.3	50° 56'.0	28'.9	270° 10'.4	41'.5
19	141° 54'.7	97° 35'.0	21'.9	107° 56'.2	18'.9	65° 57'.9	28'.9	285° 13'.1	41'.4
20	156° 57'.1	112° 34'.4	22'.9	122° 56'.8	19'.5	80° 59'.8	29'.0	300° 15'.7	41'.4
21	171° 59'.6	127° 33'.8	23'.8	137° 57'.5	20'.2	96° 01'.7	29'.0	315° 18'.4	41'.3
22	187° 02'.1	142° 33'.2	24'.8	152° 58'.2	20'.8	111° 03'.6	29'.1	330° 21'.0	41'.3
23	202° 04'.5	157° 32'.6	25'.8	167° 58'.8	21'.5	126° 05'.5	29'.1	345° 23'.7	41'.2
29 Monday 00	217° 07'.0	172° 32'.0	16° 26'.7 N	182° 59'.5	13° 22'.1 N	141° 07'.4	22° 29'.2 N	0° 26'.3	11° 41'.1 S
01	232° 09'.5	187° 31'.5	27'.7	198° 00'.2	22'.7	156° 09'.3	29'.2	15° 29'.0	41'.1
02	247° 11'.9	202° 30'.9	28'.6	213° 00'.9	23'.4	171° 11'.3	29'.3	30° 31'.6	41'.0
03	262° 14'.4	217° 30'.3	29'.6	228° 01'.5	24'.0	186° 13'.2	29'.4	45° 34'.3	41'.0
04	277° 16'.8	232° 29'.7	30'.6	243° 02'.2	24'.6	201° 15'.1	29'.4	60° 36'.9	40'.9
05	292° 19'.3	247° 29'.1	31'.5	258° 02'.9	25'.3	216° 17'.0	29'.5	75° 39'.5	40'.8
06	307° 21'.8	262° 28'.5	32'.5	273° 03'.5	25'.9	231° 18'.9	29'.5	90° 42'.2	40'.8
07	322° 24'.2	277° 27'.9	33'.5	288° 04'.2	26'.5	246° 20'.8	29'.6	105° 44'.8	40'.7
08	337° 26'.7	292° 27'.3	34'.4	303° 04'.9	27'.2	261° 22'.7	29'.6	120° 47'.5	40'.7
09	352° 29'.2	307° 26'.7	35'.4	318° 05'.5	27'.8	276° 24'.7	29'.7	135° 50'.1	40'.6
10	7° 31'.6	322° 26'.1	36'.3	333° 06'.2	28'.5	291° 26'.6	29'.7	150° 52'.8	40'.5
11	22° 34'.1	337° 25'.5	37'.3	348° 06'.9	29'.1	306° 28'.5	29'.8	165° 55'.4	40'.5
12	37° 36'.6	352° 24'.9	16° 38'.2 N	3° 07'.6	13° 29'.7 N	321° 30'.4	22° 29'.8 N	180° 58'.1	11° 40'.4 S
13	52° 39'.0	7° 24'.3	39'.2	18° 08'.2	30'.4	336° 32'.3	29'.9	196° 00'.7	40'.4
14	67° 41'.5	22° 23'.7	40'.1	33° 08'.9	31'.0	351° 34'.2	30'.0	211° 03'.4	40'.3
15	82° 44'.0	37° 23'.1	41'.1	48° 09'.6	31'.6	6° 36'.1	30'.0	226° 06'.0	40'.3
16	97° 46'.4	52° 22'.5	42'.1	63° 10'.2	32'.3	21° 38'.0	30'.1	241° 08'.7	40'.2
17	112° 48'.9	67° 21'.9	43'.0	78° 10'.9	32'.9	36° 39'.9	30'.1	256° 11'.3	40'.1
18	127° 51'.3	82° 21'.3	44'.0	93° 11'.6	33'.5	51° 41'.9	30'.2	271° 14'.0	40'.1
19	142° 53'.8	97° 20'.7	44'.9	108° 12'.2	34'.1	66° 43'.8	30'.2	286° 16'.6	40'.0
20	157° 56'.3	112° 20'.1	45'.9	123° 12'.9	34'.8	81° 45'.7	30'.3	301° 19'.3	40'.0
21	172° 58'.7	127° 19'.5	46'.8	138° 13'.6	35'.4	96° 47'.6	30'.3	316° 21'.9	39'.9
22	188° 01'.2	142° 18'.9	47'.8	153° 14'.2	36'.0	111° 49'.5	30'.4	331° 24'.6	39'.8
23	203° 03'.7	157° 18'.3	48'.7	168° 14'.9	36'.7	126° 51'.4	30'.4	346° 27'.2	39'.8
30 Tuesday 00	218° 06'.1	172° 17'.7	16° 49'.7 N	183° 15'.6	13° 37'.3 N	141° 53'.3	22° 30'.5 N	1° 29'.9	11° 39'.7 S
01	233° 08'.6	187° 17'.1	50'.6	198° 16'.3	37'.9	156° 55'.2	30'.5	16° 32'.5	39'.7
02	248° 11'.1	202° 16'.5	51'.5	213° 16'.9	38'.6	171° 57'.1	30'.6	31° 35'.2	39'.6
03	263° 13'.5	217° 15'.9	52'.5	228° 17'.6	39'.2	186° 59'.1	30'.7	46° 37'.8	39'.5
04	278° 16'.0	232° 15'.3	53'.4	243° 18'.3	39'.8	202° 01'.0	30'.7	61° 40'.5	39'.5
05	293° 18'.5	247° 14'.7	54'.4	258° 18'.9	40'.5	217° 02'.9	30'.8	76° 43'.1	39'.4
06	308° 20'.9	262° 14'.1	55'.3	273° 19'.6	41'.1	232° 04'.8	30'.8	91° 45'.7	39'.4
07	323° 23'.4	277° 13'.5	56'.3	288° 20'.3	41'.7	247° 06'.7	30'.9	106° 48'.4	39'.3
08	338° 25'.8	292° 12'.9	57'.2	303° 20'.9	42'.3	262° 08'.6	30'.9	121° 51'.0	39'.2
09	353° 28'.3	307° 12'.3	58'.1	318° 21'.6	43'.0	277° 10'.5	31'.0	136° 53'.7	39'.2
10	8° 30'.8	322° 11'.7	59'.1	333° 22'.3	43'.6	292° 12'.4	31'.0	151° 56'.3	39'.1
11	23° 33'.2	337° 11'.1	17° 00'.0 N	348° 22'.9	44'.2	307° 14'.3	31'.1	166° 59'.0	39'.1
12	38° 35'.7	352° 10'.5	17° 01'.0 N	3° 23'.6	13° 44'.9 N	322° 16'.2	22° 31'.1 N	182° 01'.6	11° 39'.0 S
13	53° 38'.2	7° 09'.9	01'.9	18° 24'.3	45'.5	337° 18'.2	31'.2	197° 04'.3	38'.9
14	68° 40'.6	22° 09'.3	02'.8	33° 24'.9	46'.1	352° 20'.1	31'.2	212° 06'.9	38'.9
15	83° 43'.1	37° 08'.7	03'.8	48° 25'.6	46'.7	7° 22'.0	31'.3	227° 09'.6	38'.8
16	98° 45'.6	52° 08'.1	04'.7	63° 26'.3	47'.4	22° 23'.9	31'.4	242° 12'.2	38'.8
17	113° 48'.0	67° 07'.5	05'.6	78° 26'.9	48'.0	37° 25'.8	31'.4	257° 14'.9	38'.7
18	128° 50'.5	82° 06'.8	06'.6	93° 27'.6	48'.6	52° 27'.7	31'.5	272° 17'.5	38'.6
19	143° 53'.0	97° 06'.2	07'.5	108° 28'.3	49'.2	67° 29'.6	31'.5	287° 20'.2	38'.6
20	158° 55'.4	112° 05'.6	08'.4	123° 28'.9	49'.9	82° 31'.5	31'.6	302° 22'.8	38'.5
21	173° 57'.9	127° 05'.0	09'.4	138° 29'.6	50'.5	97° 33'.4	31'.6	317° 25'.5	38'.5
22	189° 00'.3	142° 04'.4	10'.3	153° 30'.3	51'.1	112° 35'.3	31'.7	332° 28'.1	38'.4
23	204° 02'.8	157° 03'.8	11'.2	168° 30'.9	51'.7	127° 37'.2	31'.7	347° 30'.8	38'.3
	M.P. 09:26	v -0'.6	d 1'.0	v 0'.7	d 0'.6	v 1'.9	d 0'.1	v 2'.6	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.9	40° 15'.2 S
Achernar	335° 27'.5	57° 10'.1 S
Acrux	173° 08'.8	63° 10'.6 S
Adhara	255° 12'.8	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.3 N
Alkaid	152° 58'.5	49° 14'.8 N
Alnair	27° 44'.0	46° 53'.5 S
Alnilam	275° 46'.7	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.1 N
Alpheratz	357° 43'.9	29° 09'.7 N
Altair	62° 08'.3	8° 54'.2 N
Ankaa	353° 16'.2	42° 13'.9 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.5	69° 02'.8 S
Avior	234° 18'.1	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.5	52° 42'.6 S
Capella	280° 34'.9	46° 00'.6 N
Deneb	49° 31'.5	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.8 S
Dubhe	193° 51'.5	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.8	51° 29'.1 N
Enif	33° 47'.3	9° 56'.2 N
Fomalhaut	15° 24'.3	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.5 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.3 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.0 N
Markab	13° 38'.6	15° 16'.6 N
Menkar	314° 15'.5	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.5	69° 46'.8 S
Mirfak	308° 41'.0	49° 54'.4 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.4	56° 41'.1 S
Polaris	318° 16'.2	89° 19'.2 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.3	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.4 S
Sabik	102° 12'.4	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.5 N
Shaula	96° 21'.7	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.4	43° 29'.6 S
Vega	80° 38'.8	38° 47'.7 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	315° 25'.1	12:30
Mars	325° 52'.5	11:48
Jupiter	284° 00'.4	14:34
Saturn	143° 19'.3	23:54

	SUN		MOON				
GMT	GHA	Dec	GHA	v	Dec	d	HP
28 00	180° 37'.4	14° 07'.9 N	329° 54'.4	4'.1	19° 43'.6 S	2'.7	60'.5
01	195° 37'.5	08'.7	344° 17'.5	4'.2	46'.3	2'.6	
02	210° 37'.6	09'.5	358° 40'.7	4'.1	48'.9	2'.4	
03	225° 37'.7	10'.3	13° 03'.8	4'.1	51'.3	2'.3	
04	240° 37'.7	11'.1	27° 26'.9	4'.2	53'.6	2'.1	
05	255° 37'.8	11'.9	41° 50'.1	4'.0	55'.7	2'.0	
06	270° 37'.9	12'.6	56° 13'.1	4'.1	57'.7	1'.8	
07	285° 38'.0	13'.4	70° 36'.2	4'.1	59'.5	1'.7	
08	300° 38'.1	14'.2	84° 59'.3	4'.1	20° 01'.2 S	1'.6	
09	315° 38'.2	15'.0	99° 22'.4	4'.1	02'.8	1'.4	
10	330° 38'.3	15'.8	113° 45'.5	4'.1	04'.2	1'.2	
11	345° 38'.4	16'.6	128° 08'.6	4'.0	05'.4	1'.1	
12	0° 38'.5	14° 17'.3 N	142° 31'.6	4'.1	20° 06'.5 S	1'.0	60'.5
13	15° 38'.6	18'.1	156° 54'.7	4'.1	07'.5	0'.8	
14	30° 38'.7	18'.9	171° 17'.8	4'.1	08'.3	0'.7	
15	45° 38'.8	19'.7	185° 40'.9	4'.1	09'.0	0'.5	
16	60° 38'.8	20'.5	200° 04'.0	4'.1	09'.5	0'.4	60'.4
17	75° 38'.9	21'.2	214° 27'.1	4'.1	09'.9	0'.2	
18	90° 39'.0	22'.0	228° 50'.2	4'.1	10'.1	0'.1	
19	105° 39'.1	22'.8	243° 13'.3	4'.2	10'.2	0'.1	
20	120° 39'.2	23'.6	257° 36'.5	4'.2	10'.1	0'.2	
21	135° 39'.3	24'.4	271° 59'.7	4'.1	09'.9	0'.3	
22	150° 39'.4	25'.1	286° 22'.8	4'.2	09'.6	0'.5	
23	165° 39'.5	25'.9	300° 46'.0	4'.3	09'.1	0'.7	
29 00	180° 39'.6	14° 26'.7 N	315° 09'.3	4'.2	20° 08'.4 S	0'.7	60'.4
01	195° 39'.6	27'.5	329° 32'.5	4'.3	07'.7	1'.0	
02	210° 39'.7	28'.2	343° 55'.8	4'.3	06'.7	1'.0	60'.3
03	225° 39'.8	29'.0	358° 19'.1	4'.3	05'.7	1'.3	
04	240° 39'.9	29'.8	12° 42'.4	4'.4	04'.4	1'.3	
05	255° 40'.0	30'.6	27° 05'.8	4'.4	03'.1	1'.5	
06	270° 40'.1	31'.4	41° 29'.2	4'.4	01'.6	1'.7	
07	285° 40'.2	32'.1	55° 52'.6	4'.5	19° 59'.9 S	1'.7	
08	300° 40'.2	32'.9	70° 16'.1	4'.4	58'.2	2'.0	
09	315° 40'.3	33'.7	84° 39'.5	4'.6	56'.2	2'.0	60'.2
10	330° 40'.4	34'.4	99° 03'.1	4'.5	54'.2	2'.2	
11	345° 40'.5	35'.2	113° 26'.6	4'.7	52'.0	2'.4	
12	0° 40'.6	14° 36'.0 N	127° 50'.3	4'.6	19° 49'.6 S	2'.5	60'.2
13	15° 40'.7	36'.8	142° 13'.9	4'.7	47'.1	2'.6	
14	30° 40'.8	37'.5	156° 37'.6	4'.7	44'.5	2'.7	
15	45° 40'.8	38'.3	171° 01'.3	4'.8	41'.8	2'.9	
16	60° 40'.9	39'.1	185° 25'.1	4'.9	38'.9	3'.1	60'.1
17	75° 41'.0	39'.8	199° 49'.0	4'.9	35'.8	3'.1	
18	90° 41'.1	40'.6	214° 12'.9	4'.9	32'.7	3'.3	
19	105° 41'.2	41'.4	228° 36'.8	5'.0	29'.4	3'.5	
20	120° 41'.3	42'.2	243° 00'.8	5'.0	25'.9	3'.5	
21	135° 41'.3	42'.9	257° 24'.8	5'.1	22'.4	3'.7	
22	150° 41'.4	43'.7	271° 48'.9	5'.2	18'.7	3'.9	60'.0
23	165° 41'.5	44'.5	286° 13'.1	5'.2	14'.8	3'.9	
30 00	180° 41'.6	14° 45'.2 N	300° 37'.3	5'.2	19° 10'.9 S	4'.1	60'.0
01	195° 41'.7	46'.0	315° 01'.5	5'.3	06'.8	4'.2	
02	210° 41'.8	46'.8	329° 25'.8	5'.4	02'.6	4'.4	
03	225° 41'.8	47'.5	343° 50'.2	5'.5	18° 58'.2 S	4'.4	59'.9
04	240° 41'.9	48'.3	358° 14'.7	5'.5	53'.8	4'.6	
05	255° 42'.0	49'.1	12° 39'.2	5'.5	49'.2	4'.8	
06	270° 42'.1	49'.8	27° 03'.7	5'.7	44'.4	4'.8	
07	285° 42'.2	50'.6	41° 28'.4	5'.7	39'.6	5'.0	
08	300° 42'.2	51'.3	55° 53'.1	5'.7	34'.6	5'.0	59'.8
09	315° 42'.3	52'.1	70° 17'.8	5'.8	29'.6	5'.3	
10	330° 42'.4	52'.9	84° 42'.6	5'.9	24'.3	5'.3	
11	345° 42'.5	53'.6	99° 07'.5	6'.0	19'.0	5'.4	
12	0° 42'.6	14° 54'.4 N	113° 32'.5	6'.0	18° 13'.6 S	5'.6	59'.8
13	15° 42'.6	55'.2	127° 57'.5	6'.1	08'.0	5'.7	59'.7
14	30° 42'.7	55'.9	142° 22'.6	6'.2	02'.3	5'.8	
15	45° 42'.8	56'.7	156° 47'.8	6'.2	17° 56'.5 S	5'.9	
16	60° 42'.9	57'.4	171° 13'.0	6'.3	50'.6	6'.0	
17	75° 42'.9	58'.2	185° 38'.3	6'.4	44'.6	6'.1	59'.6
18	90° 43'.0	59'.0	200° 03'.7	6'.5	38'.5	6'.3	
19	105° 43'.1	59'.7	214° 29'.2	6'.5	32'.2	6'.3	
20	120° 43'.2	15° 00'.5 N	228° 54'.7	6'.6	25'.9	6'.5	
21	135° 43'.3	01'.2	243° 20'.3	6'.7	19'.4	6'.5	
22	150° 43'.3	02'.0	257° 46'.0	6'.7	12'.9	6'.7	59'.5
23	165° 43'.4	02'.8	272° 11'.7	6'.8	06'.2	6'.8	
	SD 15'.9	d 0'.8	SD 16'.5		16'.4	16'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30
N 72°	-	-	02:08	-	-	-
N 70°	-	-	02:42	01:54	-	02:54
68°	-	01:26	03:06	00:16	01:28	02:01
66°	-	02:07	03:25	-	00:46	01:28
64°	-	02:34	03:40	-	00:18	01:03
62°	01:16	02:55	03:52	23:56	-	00:44
60°	01:53	03:11	04:03	23:38	-	00:28
N 58°	02:18	03:25	04:12	23:23	-	00:15
56°	02:37	03:37	04:20	23:11	-	00:03
54°	02:53	03:47	04:28	23:00	23:53	24:35
52°	03:06	03:56	04:34	22:50	23:44	24:27
50°	03:18	04:04	04:40	22:41	23:36	24:21
45°	03:41	04:20	04:52	22:23	23:19	24:06
N 40°	03:58	04:33	05:03	22:08	23:04	23:54
35°	04:12	04:44	05:11	21:55	22:52	23:43
30°	04:24	04:54	05:19	21:44	22:42	23:34
20°	04:42	05:09	05:32	21:25	22:24	23:18
N 10°	04:56	05:22	05:43	21:08	22:08	23:04
0°	05:08	05:33	05:54	20:52	21:53	22:52
S 10°	05:18	05:43	06:04	20:37	21:38	22:39
20°	05:26	05:53	06:15	20:20	21:23	22:25
30°	05:35	06:03	06:28	20:01	21:04	22:09
35°	05:39	06:09	06:35	19:50	20:54	22:00
40°	05:43	06:15	06:43	19:38	20:42	21:49
45°	05:47	06:22	06:52	19:23	20:28	21:37
S 50°	05:51	06:30	07:04	19:05	20:10	21:21
52°	05:53	06:33	07:09	18:56	20:02	21:14
54°	05:55	06:37	07:15	18:46	19:53	21:07
56°	05:57	06:41	07:21	18:36	19:42	20:58
58°	05:59	06:46	07:28	18:23	19:31	20:48
S 60°	06:02	06:51	07:36	18:09	19:17	20:36
S 62°	06:04	06:57	07:46	17:52	19:01	20:23

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 28	Moonset 29	Moonset 30
N 72°	21:53	-	-	-	-	-
N 70°	21:17	-	-	02:13	-	05:28
68°	20:52	22:37	-	03:51	04:48	06:21
66°	20:32	21:53	-	04:31	05:30	06:54
64°	20:17	21:24	-	04:58	05:58	07:18
62°	20:04	21:03	22:46	05:19	06:20	07:37
60°	19:53	20:46	22:06	05:37	06:37	07:52
N 58°	19:44	20:32	21:40	05:51	06:52	08:05
56°	19:36	20:20	21:20	06:03	07:05	08:16
54°	19:28	20:09	21:04	06:14	07:16	08:26
52°	19:22	20:00	20:50	06:24	07:25	08:35
50°	19:16	19:52	20:39	06:33	07:34	08:43
45°	19:03	19:35	20:15	06:51	07:52	09:00
N 40°	18:53	19:22	19:57	07:06	08:07	09:13
35°	18:44	19:11	19:43	07:18	08:20	09:25
30°	18:36	19:01	19:31	07:29	08:31	09:35
20°	18:23	18:46	19:13	07:48	08:50	09:52
N 10°	18:11	18:33	18:59	08:05	09:06	10:07
0°	18:01	18:22	18:47	08:20	09:22	10:21
S 10°	17:50	18:12	18:37	08:36	09:37	10:35
20°	17:39	18:02	18:28	08:52	09:53	10:50
30°	17:27	17:51	18:20	09:11	10:12	11:07
35°	17:19	17:45	18:15	09:22	10:23	11:17
40°	17:11	17:39	18:11	09:34	10:35	11:28
45°	17:02	17:32	18:07	09:49	10:50	11:41
S 50°	16:50	17:24	18:02	10:07	11:07	11:57
52°	16:45	17:21	18:00	10:16	11:16	12:04
54°	16:39	17:17	17:58	10:25	11:25	12:13
56°	16:33	17:12	17:56	10:36	11:36	12:22
58°	16:25	17:08	17:54	10:49	11:48	12:32
S 60°	16:17	17:02	17:52	11:03	12:02	12:44
S 62°	16:08	16:57	17:49	11:20	12:18	12:58

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
28	2 29	2 34	11:57	02:06	14:36	18d 90%
29	2 38	2 42	11:57	03:07	15:37	19d 82%
30	2 46	2 50	11:57	04:07	16:37	20d 72%

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2013 May 1, 2, 3 (Wed, Thur, Fri)

GMT	ARIES	VENUS -3.9		MARS +1.3		JUPITER -2.0		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
Wednesday 1 00	219° 05'.3	172° 03'.2	17° 12'.1 N	183° 31'.6	13° 52'.4 N	142° 39'.1	22° 31'.8 N	2° 33'.4	11° 38'.3 S
01	234° 07'.7	187° 02'.6	13'.1	198° 32'.3	53'.0	157° 41'.0	31'.8	17° 36'.1	38'.2
02	249° 10'.2	202° 01'.9	14'.0	213° 32'.9	53'.6	172° 43'.0	31'.9	32° 38'.7	38'.2
03	264° 12'.7	217° 01'.3	14'.9	228° 33'.6	54'.2	187° 44'.9	31'.9	47° 41'.4	38'.1
04	279° 15'.1	232° 00'.7	15'.9	243° 34'.3	54'.9	202° 46'.8	32'.0	62° 44'.0	38'.1
05	294° 17'.6	247° 00'.1	16'.8	258° 34'.9	55'.5	217° 48'.7	32'.1	77° 46'.6	38'.0
06	309° 20'.1	261° 59'.5	17'.7	273° 35'.6	56'.1	232° 50'.6	32'.1	92° 49'.3	37'.9
07	324° 22'.5	276° 58'.9	18'.6	288° 36'.3	56'.7	247° 52'.5	32'.2	107° 51'.9	37'.9
08	339° 25'.0	291° 58'.3	19'.6	303° 36'.9	57'.4	262° 54'.4	32'.2	122° 54'.6	37'.8
09	354° 27'.4	306° 57'.6	20'.5	318° 37'.6	58'.0	277° 56'.3	32'.3	137° 57'.2	37'.8
10	9° 29'.9	321° 57'.0	21'.4	333° 38'.3	58'.6	292° 58'.2	32'.3	152° 59'.9	37'.7
11	24° 32'.4	336° 56'.4	22'.3	348° 38'.9	59'.2	308° 00'.1	32'.4	168° 02'.5	37'.6
12	39° 34'.8	351° 55'.8	17° 23'.2 N	3° 39'.6	13° 59'.9 N	323° 02'.0	22° 32'.4 N	183° 05'.2	11° 37'.6 S
13	54° 37'.3	6° 55'.2	24'.2	18° 40'.3	14° 00'.5 N	338° 03'.9	32'.5	198° 07'.8	37'.5
14	69° 39'.8	21° 54'.5	25'.1	33° 40'.9	01'.1	353° 05'.8	32'.5	213° 10'.5	37'.5
15	84° 42'.2	36° 53'.9	26'.0	48° 41'.6	01'.7	8° 07'.7	32'.6	228° 13'.1	37'.4
16	99° 44'.7	51° 53'.3	26'.9	63° 42'.3	02'.3	23° 09'.6	32'.6	243° 15'.8	37'.3
17	114° 47'.2	66° 52'.7	27'.8	78° 42'.9	03'.0	38° 11'.6	32'.7	258° 18'.4	37'.3
18	129° 49'.6	81° 52'.1	28'.7	93° 43'.6	03'.6	53° 13'.5	32'.7	273° 21'.1	37'.2
19	144° 52'.1	96° 51'.4	29'.6	108° 44'.3	04'.2	68° 15'.4	32'.8	288° 23'.7	37'.2
20	159° 54'.6	111° 50'.8	30'.6	123° 44'.9	04'.8	83° 17'.3	32'.9	303° 26'.4	37'.1
21	174° 57'.0	126° 50'.2	31'.5	138° 45'.6	05'.4	98° 19'.2	32'.9	318° 29'.0	37'.0
22	189° 59'.5	141° 49'.6	32'.4	153° 46'.3	06'.1	113° 21'.1	33'.0	333° 31'.7	37'.0
23	205° 01'.9	156° 48'.9	33'.3	168° 46'.9	06'.7	128° 23'.0	33'.0	348° 34'.3	36'.9
Thursday 2 00	220° 04'.4	171° 48'.3	17° 34'.2 N	183° 47'.6	14° 07'.3 N	143° 24'.9	22° 33'.1 N	3° 37'.0	11° 36'.9 S
01	235° 06'.9	186° 47'.7	35'.1	198° 48'.3	07'.9	158° 26'.8	33'.1	18° 39'.6	36'.8
02	250° 09'.3	201° 47'.1	36'.0	213° 48'.9	08'.5	173° 28'.7	33'.2	33° 42'.2	36'.8
03	265° 11'.8	216° 46'.4	36'.9	228° 49'.6	09'.2	188° 30'.6	33'.2	48° 44'.9	36'.7
04	280° 14'.3	231° 45'.8	37'.8	243° 50'.3	09'.8	203° 32'.5	33'.3	63° 47'.5	36'.6
05	295° 16'.7	246° 45'.2	38'.7	258° 50'.9	10'.4	218° 34'.4	33'.3	78° 50'.2	36'.6
06	310° 19'.2	261° 44'.6	39'.7	273° 51'.6	11'.0	233° 36'.3	33'.4	93° 52'.8	36'.5
07	325° 21'.7	276° 43'.9	40'.6	288° 52'.2	11'.6	248° 38'.2	33'.4	108° 55'.5	36'.5
08	340° 24'.1	291° 43'.3	41'.5	303° 52'.9	12'.2	263° 40'.1	33'.5	123° 58'.1	36'.4
09	355° 26'.6	306° 42'.7	42'.4	318° 53'.6	12'.9	278° 42'.0	33'.5	139° 00'.8	36'.3
10	10° 29'.1	321° 42'.0	43'.3	333° 54'.2	13'.5	293° 43'.9	33'.6	154° 03'.4	36'.3
11	25° 31'.5	336° 41'.4	44'.2	348° 54'.9	14'.1	308° 45'.8	33'.6	169° 06'.1	36'.2
12	40° 34'.0	351° 40'.8	17° 45'.1 N	3° 55'.6	14° 14'.7 N	323° 47'.7	22° 33'.7 N	184° 08'.7	11° 36'.2 S
13	55° 36'.4	6° 40'.2	46'.0	18° 56'.2	15'.3	338° 49'.6	33'.8	199° 11'.4	36'.1
14	70° 38'.9	21° 39'.5	46'.9	33° 56'.9	15'.9	353° 51'.5	33'.8	214° 14'.0	36'.0
15	85° 41'.4	36° 38'.9	47'.8	48° 57'.6	16'.6	8° 53'.5	33'.9	229° 16'.7	36'.0
16	100° 43'.8	51° 38'.3	48'.7	63° 58'.2	17'.2	23° 55'.4	33'.9	244° 19'.3	35'.9
17	115° 46'.3	66° 37'.6	49'.6	78° 58'.9	17'.8	38° 57'.3	34'.0	259° 22'.0	35'.9
18	130° 48'.8	81° 37'.0	50'.5	93° 59'.5	18'.4	53° 59'.2	34'.0	274° 24'.6	35'.8
19	145° 51'.2	96° 36'.4	51'.3	109° 00'.2	19'.0	69° 01'.1	34'.1	289° 27'.3	35'.8
20	160° 53'.7	111° 35'.7	52'.2	124° 00'.9	19'.6	84° 03'.0	34'.1	304° 29'.9	35'.7
21	175° 56'.2	126° 35'.1	53'.1	139° 01'.5	20'.2	99° 04'.9	34'.2	319° 32'.5	35'.6
22	190° 58'.6	141° 34'.5	54'.0	154° 02'.2	20'.8	114° 06'.8	34'.2	334° 35'.2	35'.6
23	206° 01'.1	156° 33'.8	54'.9	169° 02'.9	21'.5	129° 08'.7	34'.3	349° 37'.8	35'.5
Friday 3 00	221° 03'.5	171° 33'.2	17° 55'.8 N	184° 03'.5	14° 22'.1 N	144° 10'.6	22° 34'.3 N	4° 40'.5	11° 35'.5 S
01	236° 06'.0	186° 32'.5	56'.7	199° 04'.2	22'.7	159° 12'.5	34'.4	19° 43'.1	35'.4
02	251° 08'.5	201° 31'.9	57'.6	214° 04'.9	23'.3	174° 14'.4	34'.4	34° 45'.8	35'.3
03	266° 10'.9	216° 31'.3	58'.5	229° 05'.5	23'.9	189° 16'.3	34'.5	49° 48'.4	35'.3
04	281° 13'.4	231° 30'.6	59'.4	244° 06'.2	24'.5	204° 18'.2	34'.5	64° 51'.1	35'.2
05	296° 15'.9	246° 30'.0	18° 00'.3 N	259° 06'.8	25'.1	219° 20'.1	34'.6	79° 53'.7	35'.2
06	311° 18'.3	261° 29'.4	01'.1	274° 07'.5	25'.7	234° 22'.0	34'.6	94° 56'.4	35'.1
07	326° 20'.8	276° 28'.7	02'.0	289° 08'.2	26'.4	249° 23'.9	34'.7	109° 59'.0	35'.0
08	341° 23'.3	291° 28'.1	02'.9	304° 08'.8	27'.0	264° 25'.8	34'.7	125° 01'.7	35'.0
09	356° 25'.7	306° 27'.4	03'.8	319° 09'.5	27'.6	279° 27'.7	34'.8	140° 04'.3	34'.9
10	11° 28'.2	321° 26'.8	04'.7	334° 10'.2	28'.2	294° 29'.6	34'.9	155° 07'.0	34'.9
11	26° 30'.7	336° 26'.2	05'.6	349° 10'.8	28'.8	309° 31'.5	34'.9	170° 09'.6	34'.8
12	41° 33'.1	351° 25'.5	18° 06'.4 N	4° 11'.5	14° 29'.4 N	324° 33'.4	22° 35'.0 N	185° 12'.3	11° 34'.8 S
13	56° 35'.6	6° 24'.9	07'.3	19° 12'.1	30'.0	339° 35'.3	35'.0	200° 14'.9	34'.7
14	71° 38'.0	21° 24'.2	08'.2	34° 12'.8	30'.6	354° 37'.2	35'.1	215° 17'.5	34'.6
15	86° 40'.5	36° 23'.6	09'.1	49° 13'.5	31'.2	9° 39'.1	35'.1	230° 20'.2	34'.6
16	101° 43'.0	51° 22'.9	10'.0	64° 14'.1	31'.8	24° 41'.0	35'.2	245° 22'.8	34'.5
17	116° 45'.4	66° 22'.3	10'.8	79° 14'.8	32'.5	39° 42'.9	35'.2	260° 25'.5	34'.5
18	131° 47'.9	81° 21'.6	11'.7	94° 15'.4	33'.1	54° 44'.8	35'.3	275° 28'.1	34'.4
19	146° 50'.4	96° 21'.0	12'.6	109° 16'.1	33'.7	69° 46'.7	35'.3	290° 30'.8	34'.3
20	161° 52'.8	111° 20'.4	13'.5	124° 16'.8	34'.3	84° 48'.6	35'.4	305° 33'.4	34'.3
21	176° 55'.3	126° 19'.7	14'.3	139° 17'.4	34'.9	99° 50'.5	35'.4	320° 36'.1	34'.2
22	191° 57'.8	141° 19'.1	15'.2	154° 18'.1	35'.5	114° 52'.4	35'.5	335° 38'.7	34'.2
23	207° 00'.2	156° 18'.4	16'.1	169° 18'.8	36'.1	129° 54'.3	35'.5	350° 41'.4	34'.1
	M.P. 09:14	v -0'.6	d 0'.9	v 0'.7	d 0'.6	v 1'.9	d 0'.1	v 2'.6	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.2 S
Achernar	335° 27'.4	57° 10'.1 S
Acrux	173° 08'.8	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.3 N
Alkaid	152° 58'.5	49° 14'.8 N
Alnair	27° 44'.0	46° 53'.5 S
Alnilam	275° 46'.7	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.1 N
Alpheratz	357° 43'.8	29° 09'.7 N
Altair	62° 08'.2	8° 54'.2 N
Ankaa	353° 16'.2	42° 13'.9 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.4	69° 02'.8 S
Avior	234° 18'.1	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.5	52° 42'.6 S
Capella	280° 35'.0	46° 00'.6 N
Deneb	49° 31'.5	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.8 S
Dubhe	193° 51'.5	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.8	51° 29'.1 N
Enif	33° 47'.3	9° 56'.2 N
Fomalhaut	15° 24'.3	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.5 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.3 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.0 N
Markab	13° 38'.6	15° 16'.6 N
Menkar	314° 15'.5	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.6	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.4 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.3	56° 41'.1 S
Polaris	318° 16'.1	89° 19'.2 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.3	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.4 S
Sabik	102° 12'.4	15° 44'.4 S
Schedar	349° 41'.1	56° 36'.5 N
Shaula	96° 21'.7	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.5	43° 29'.6 S
Vega	80° 38'.8	38° 47'.7 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	311° 43'.9	12:33
Mars	323° 43'.2	11:44
Jupiter	283° 20'.5	14:25
Saturn	143° 32'.5	23:41

GMT	SUN		MOON					
	GHA	Dec	GHA	v	Dec	d	HP
Wednesday 1 00	180° 43'.5	15° 03'.5 N	286° 37'.5	6'.9	16° 59'.4 S	6'.9	59'.5
01	195° 43'.6	04'.3	301° 03'.4	7'.0	52'.5	6'.9	
02	210° 43'.6	05'.0	315° 29'.4	7'.1	45'.6	7'.1	59'.4
03	225° 43'.7	05'.8	329° 55'.5	7'.1	38'.5	7'.2	
04	240° 43'.8	06'.5	344° 21'.6	7'.2	31'.3	7'.3	
05	255° 43'.9	07'.3	358° 47'.8	7'.3	24'.0	7'.4	
06	270° 43'.9	08'.0	13° 14'.1	7'.3	16'.6	7'.4	59'.3
07	285° 44'.0	08'.8	27° 40'.4	7'.5	09'.2	7'.6	
08	300° 44'.1	09'.6	42° 06'.9	7'.5	01'.6	7'.6	
09	315° 44'.2	10'.3	56° 33'.4	7'.6	15° 54'.0 S	7'.8	
10	330° 44'.2	11'.1	71° 00'.0	7'.6	46'.2	7'.8	59'.2
11	345° 44'.3	11'.8	85° 26'.6	7'.8	38'.4	8'.0	
12	0° 44'.4	15° 12'.6 N	99° 53'.4	7'.8	15° 30'.4 S	8'.0	59'.2
13	15° 44'.5	13'.3	114° 20'.2	7'.9	22'.4	8'.1	
14	30° 44'.5	14'.1	128° 47'.1	8'.0	14'.3	8'.2	59'.1
15	45° 44'.6	14'.8	143° 14'.1	8'.0	06'.1	8'.3	
16	60° 44'.7	15'.6	157° 41'.1	8'.1	14° 57'.8 S	8'.3	
17	75° 44'.8	16'.3	172° 08'.2	8'.2	49'.5	8'.5	
18	90° 44'.8	17'.1	186° 35'.4	8'.3	41'.0	8'.5	59'.0
19	105° 44'.9	17'.8	201° 02'.7	8'.4	32'.5	8'.6	
20	120° 45'.0	18'.6	215° 30'.1	8'.4	23'.9	8'.7	
21	135° 45'.0	19'.3	229° 57'.5	8'.5	15'.2	8'.8	
22	150° 45'.1	20'.1	244° 25'.0	8'.6	06'.4	8'.8	58'.9
23	165° 45'.2	20'.8	258° 52'.6	8'.7	13° 57'.6 S	8'.9	
Thursday 2 00	180° 45'.3	15° 21'.6 N	273° 20'.3	8'.7	13° 48'.7 S	9'.0	58'.9
01	195° 45'.3	22'.3	287° 48'.0	8'.9	39'.7	9'.0	
02	210° 45'.4	23'.0	302° 15'.9	8'.8	30'.7	9'.2	58'.8
03	225° 45'.5	23'.8	316° 43'.7	9'.0	21'.5	9'.2	
04	240° 45'.5	24'.5	331° 11'.7	9'.1	12'.3	9'.2	
05	255° 45'.6	25'.3	345° 39'.8	9'.1	03'.1	9'.4	
06	270° 45'.7	26'.0	0° 07'.9	9'.2	12° 53'.7 S	9'.4	58'.7
07	285° 45'.7	26'.8	14° 36'.1	9'.2	44'.3	9'.4	
08	300° 45'.8	27'.5	29° 04'.3	9'.4	34'.9	9'.5	
09	315° 45'.9	28'.3	43° 32'.7	9'.4	25'.4	9'.6	58'.6
10	330° 45'.9	29'.0	58° 01'.1	9'.5	15'.8	9'.7	
11	345° 46'.0	29'.7	72° 29'.6	9'.5	06'.1	9'.7	
12	0° 46'.1	15° 30'.5 N	86° 58'.1	9'.6	11° 56'.4 S	9'.8	58'.6
13	15° 46'.1	31'.2	101° 26'.7	9'.7	46'.6	9'.8	58'.5
14	30° 46'.2	32'.0	115° 55'.4	9'.8	36'.8	9'.9	
15	45° 46'.3	32'.7	130° 24'.2	9'.8	26'.9	9'.9	
16	60° 46'.3	33'.4	144° 53'.0	10'.0	17'.0	10'.0	
17	75° 46'.4	34'.2	159° 22'.0	9'.9	07'.0	10'.0	58'.4
18	90° 46'.5	34'.9	173° 50'.9	10'.1	10° 57'.0 S	10'.1	
19	105° 46'.5	35'.7	188° 20'.0	10'.1	46'.9	10'.2	
20	120° 46'.6	36'.4	202° 49'.1	10'.2	36'.7	10'.2	
21	135° 46'.7	37'.1	217° 18'.3	10'.2	26'.5	10'.2	58'.3
22	150° 46'.7	37'.9	231° 47'.5	10'.3	16'.3	10'.3	
23	165° 46'.8	38'.6	246° 16'.8	10'.4	06'.0	10'.4	
Friday 3 00	180° 46'.9	15° 39'.3 N	260° 46'.2	10'.4	9° 55'.6 S	10'.3	58'.2
01	195° 46'.9	40'.1	275° 15'.6	10'.5	45'.3	10'.5	
02	210° 47'.0	40'.8	289° 45'.1	10'.6	34'.8	10'.4	
03	225° 47'.1	41'.5	304° 14'.7	10'.6	24'.4	10'.5	
04	240° 47'.1	42'.3	318° 44'.3	10'.7	13'.9	10'.6	58'.1
05	255° 47'.2	43'.0	333° 14'.0	10'.8	03'.3	10'.6	
06	270° 47'.3	43'.7	347° 43'.8	10'.8	8° 52'.7 S	10'.6	
07	285° 47'.3	44'.5	2° 13'.6	10'.9	42'.1	10'.7	
08	300° 47'.4	45'.2	16° 43'.5	10'.9	31'.4	10'.7	58'.0
09	315° 47'.4	45'.9	31° 13'.4	11'.0	20'.7	10'.7	
10	330° 47'.5	46'.7	45° 43'.4	11'.1	10'.0	10'.7	
11	345° 47'.6	47'.4	60° 13'.5	11'.1	7° 59'.3 S	10'.8	
12	0° 47'.6	15° 48'.1 N	74° 43'.6	11'.1	7° 48'.5 S	10'.9	57'.9
13	15° 47'.7	48'.9	89° 13'.7	11'.2	37'.6	10'.8	
14	30° 47'.8	49'.6	103° 43'.9	11'.3	26'.8	10'.9	
15	45° 47'.8	50'.3	118° 14'.2	11'.4	15'.9	10'.9	57'.8
16	60° 47'.9	51'.0	132° 44'.6	11'.3	05'.0	11'.0	
17	75° 47'.9	51'.8	147° 14'.9	11'.5	6° 54'.0 S	11'.0	
18	90° 48'.0	52'.5	161° 45'.4	11'.5	43'.0	11'.0	
19	105° 48'.1	53'.2	176° 15'.9	11'.5	32'.0	11'.0	57'.7
20	120° 48'.1	54'.0	190° 46'.4	11'.6	21'.0	11'.0	
21	135° 48'.2	54'.7	205° 17'.0	11'.6	10'.0	11'.1	
22	150° 48'.2	55'.4	219° 47'.6	11'.7	5° 58'.9 S	11'.1	
23	165° 48'.3	56'.1	234° 18'.3	11'.7	47'.8	11'.1	57'.6
	SD 15'.9	d 0'.7	SD	16'.1	16'.0	15'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3
N 72°	-	-	01:43	03:32	03:04	02:48
N 70°	-	-	02:24	02:45	02:38	02:33
68°	-	00:53	02:52	02:13	02:19	02:21
66°	-	01:48	03:13	01:50	02:03	02:12
64°	-	02:20	03:30	01:32	01:50	02:03
62°	00:47	02:43	03:43	01:17	01:40	01:56
60°	01:36	03:01	03:55	01:04	01:30	01:50
N 58°	02:05	03:16	04:05	00:53	01:22	01:45
56°	02:27	03:29	04:14	00:44	01:15	01:40
54°	02:44	03:40	04:21	00:35	01:08	01:35
52°	02:58	03:49	04:28	00:27	01:02	01:31
50°	03:11	03:58	04:35	00:21	00:57	01:28
45°	03:35	04:15	04:48	00:06	00:46	01:20
N 40°	03:54	04:29	04:59	-	00:36	01:13
35°	04:08	04:41	05:08	-	00:28	01:07
30°	04:21	04:51	05:16	-	00:21	01:02
20°	04:40	05:07	05:30	-	00:08	00:54
N 10°	04:55	05:20	05:42	23:57	-	00:46
0°	05:07	05:32	05:54	23:47	-	00:39
S 10°	05:18	05:43	06:05	23:36	-	00:32
20°	05:27	05:54	06:16	23:25	-	00:24
30°	05:36	06:05	06:30	23:13	-	00:15
35°	05:41	06:11	06:37	23:05	-	00:10
40°	05:46	06:18	06:46	22:57	-	00:04
45°	05:50	06:25	06:56	22:47	23:57	25:06
S 50°	05:55	06:34	07:08	22:35	23:49	25:02
52°	05:58	06:38	07:14	22:30	23:45	25:00
54°	06:00	06:42	07:20	22:24	23:41	24:57
56°	06:02	06:47	07:27	22:17	23:37	24:55
58°	06:05	06:52	07:35	22:09	23:31	24:52
S 60°	06:08	06:58	07:44	22:00	23:26	24:49
S 62°	06:11	07:04	07:54	21:50	23:19	24:46

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 1	Moonset 2	Moonset 3
N 72°	22:19	-	-	06:52	09:14	11:16
N 70°	21:34	-	-	07:38	09:37	11:29
68°	21:05	23:15	-	08:08	09:56	11:39
66°	20:44	22:11	-	08:31	10:10	11:47
64°	20:26	21:38	-	08:48	10:22	11:54
62°	20:12	21:14	23:19	09:03	10:32	12:00
60°	20:01	20:55	22:23	09:15	10:40	12:05
N 58°	19:50	20:40	21:52	09:25	10:48	12:10
56°	19:42	20:27	21:30	09:34	10:54	12:14
54°	19:34	20:16	21:12	09:42	11:00	12:18
52°	19:27	20:06	20:57	09:50	11:06	12:21
50°	19:20	19:57	20:45	09:56	11:10	12:24
45°	19:07	19:39	20:20	10:10	11:21	12:30
N 40°	18:56	19:25	20:01	10:21	11:29	12:35
35°	18:46	19:13	19:46	10:31	11:36	12:40
30°	18:38	19:03	19:34	10:39	11:43	12:44
20°	18:24	18:47	19:14	10:54	11:54	12:51
N 10°	18:12	18:34	18:59	11:07	12:03	12:57
0°	18:00	18:22	18:47	11:18	12:12	13:03
S 10°	17:49	18:11	18:36	11:30	12:21	13:08
20°	17:37	18:00	18:26	11:42	12:30	13:14
30°	17:24	17:49	18:17	11:56	12:41	13:21
35°	17:16	17:43	18:13	12:05	12:47	13:25
40°	17:07	17:36	18:08	12:14	12:54	13:29
45°	16:57	17:28	18:03	12:25	13:02	13:34
S 50°	16:45	17:19	17:58	12:38	13:11	13:40
52°	16:39	17:15	17:55	12:44	13:15	13:42
54°	16:33	17:11	17:53	12:50	13:20	13:45
56°	16:26	17:06	17:51	12:58	13:26	13:49
58°	16:18	17:01	17:48	13:06	13:32	13:52
S 60°	16:09	16:55	17:45	13:15	13:38	13:56
S 62°	15:59	16:49	17:42	13:26	13:46	14:01

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
1	2 54	2 57	11:57	05:05	17:33	21d 61%
2	3 01	3 04	11:57	05:59	18:25	22d 50%
3	3 07	3 10	11:57	06:51	19:15	23d 39%

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2013 May 4, 5, 6 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.3		JUPITER -2.0		SATURN +0.1	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
4 Saturday 00	222° 02'.7	171° 17'.8	18° 16'.9 N	184° 19'.4	14° 36'.7 N	144° 56'.2	22° 35'.6 N	5° 44'.0	11° 34'.1 S
01	237° 05'.2	186° 17'.1	17'.8	199° 20'.1	37'.3	159° 58'.1	35'.6	20° 46'.7	34'.0
02	252° 07'.6	201° 16'.5	18'.7	214° 20'.7	37'.9	175° 00'.0	35'.7	35° 49'.3	33'.9
03	267° 10'.1	216° 15'.8	19'.6	229° 21'.4	38'.5	190° 01'.9	35'.7	50° 52'.0	33'.9
04	282° 12'.5	231° 15'.2	20'.4	244° 22'.1	39'.1	205° 03'.8	35'.8	65° 54'.6	33'.8
05	297° 15'.0	246° 14'.5	21'.3	259° 22'.7	39'.7	220° 05'.7	35'.8	80° 57'.2	33'.8
06	312° 17'.5	261° 13'.9	22'.2	274° 23'.4	40'.3	235° 07'.6	35'.9	95° 59'.9	33'.7
07	327° 19'.9	276° 13'.2	23'.0	289° 24'.0	40'.9	250° 09'.5	35'.9	111° 02'.5	33'.6
08	342° 22'.4	291° 12'.6	23'.9	304° 24'.7	41'.5	265° 11'.4	36'.0	126° 05'.2	33'.6
09	357° 24'.9	306° 11'.9	24'.7	319° 25'.4	42'.2	280° 13'.3	36'.0	141° 07'.8	33'.5
10	12° 27'.3	321° 11'.3	25'.6	334° 26'.0	42'.8	295° 15'.2	36'.1	156° 10'.5	33'.5
11	27° 29'.8	336° 10'.6	26'.5	349° 26'.7	43'.4	310° 17'.1	36'.1	171° 13'.1	33'.4
12	42° 32'.3	351° 10'.0	18° 27'.3 N	4° 27'.3	14° 44'.0 N	325° 19'.0	22° 36'.2 N	186° 15'.8	11° 33'.3 S
13	57° 34'.7	6° 09'.3	28'.2	19° 28'.0	44'.6	340° 20'.9	36'.2	201° 18'.4	33'.3
14	72° 37'.2	21° 08'.6	29'.1	34° 28'.7	45'.2	355° 22'.8	36'.3	216° 21'.1	33'.2
15	87° 39'.6	36° 08'.0	29'.9	49° 29'.3	45'.8	10° 24'.7	36'.3	231° 23'.7	33'.2
16	102° 42'.1	51° 07'.3	30'.8	64° 30'.0	46'.4	25° 26'.6	36'.4	246° 26'.4	33'.1
17	117° 44'.6	66° 06'.7	31'.6	79° 30'.6	47'.0	40° 28'.5	36'.5	261° 29'.0	33'.1
18	132° 47'.0	81° 06'.0	32'.5	94° 31'.3	47'.6	55° 30'.4	36'.5	276° 31'.7	33'.0
19	147° 49'.5	96° 05'.4	33'.3	109° 32'.0	48'.2	70° 32'.3	36'.6	291° 34'.3	32'.9
20	162° 52'.0	111° 04'.7	34'.2	124° 32'.6	48'.8	85° 34'.2	36'.6	306° 36'.9	32'.9
21	177° 54'.4	126° 04'.0	35'.0	139° 33'.3	49'.4	100° 36'.1	36'.7	321° 39'.6	32'.8
22	192° 56'.9	141° 03'.4	35'.9	154° 33'.9	50'.0	115° 37'.9	36'.7	336° 42'.2	32'.8
23	207° 59'.4	156° 02'.7	36'.8	169° 34'.6	50'.6	130° 39'.8	36'.8	351° 44'.9	32'.7
5 Sunday 00	223° 01'.8	171° 02'.1	18° 37'.6 N	184° 35'.3	14° 51'.2 N	145° 41'.7	22° 36'.8 N	6° 47'.5	11° 32'.7 S
01	238° 04'.3	186° 01'.4	38'.5	199° 35'.9	51'.8	160° 43'.6	36'.9	21° 50'.2	32'.6
02	253° 06'.8	201° 00'.8	39'.3	214° 36'.6	52'.4	175° 45'.5	36'.9	36° 52'.8	32'.5
03	268° 09'.2	216° 00'.1	40'.2	229° 37'.2	53'.0	190° 47'.4	37'.0	51° 55'.5	32'.5
04	283° 11'.7	230° 59'.4	41'.0	244° 37'.9	53'.6	205° 49'.3	37'.0	66° 58'.1	32'.4
05	298° 14'.1	245° 58'.8	41'.8	259° 38'.5	54'.2	220° 51'.2	37'.1	82° 00'.8	32'.4
06	313° 16'.6	260° 58'.1	42'.7	274° 39'.2	54'.8	235° 53'.1	37'.1	97° 03'.4	32'.3
07	328° 19'.1	275° 57'.4	43'.5	289° 39'.9	55'.4	250° 55'.0	37'.2	112° 06'.1	32'.2
08	343° 21'.5	290° 56'.8	44'.4	304° 40'.5	56'.0	265° 56'.9	37'.2	127° 08'.7	32'.2
09	358° 24'.0	305° 56'.1	45'.2	319° 41'.2	56'.6	280° 58'.8	37'.3	142° 11'.3	32'.1
10	13° 26'.5	320° 55'.4	46'.1	334° 41'.8	57'.2	296° 00'.7	37'.3	157° 14'.0	32'.1
11	28° 28'.9	335° 54'.8	46'.9	349° 42'.5	57'.8	311° 02'.6	37'.4	172° 16'.6	32'.0
12	43° 31'.4	350° 54'.1	18° 47'.7 N	4° 43'.2	14° 58'.4 N	326° 04'.5	22° 37'.4 N	187° 19'.3	11° 32'.0 S
13	58° 33'.9	5° 53'.5	48'.6	19° 43'.8	59'.0	341° 06'.4	37'.5	202° 21'.9	31'.9
14	73° 36'.3	20° 52'.8	49'.4	34° 44'.5	59'.6	356° 08'.3	37'.5	217° 24'.6	31'.8
15	88° 38'.8	35° 52'.1	50'.3	49° 45'.1	15° 00'.2 N	11° 10'.2	37'.6	232° 27'.2	31'.8
16	103° 41'.2	50° 51'.5	51'.1	64° 45'.8	00'.8	26° 12'.1	37'.6	247° 29'.9	31'.7
17	118° 43'.7	65° 50'.8	51'.9	79° 46'.4	01'.3	41° 14'.0	37'.7	262° 32'.5	31'.7
18	133° 46'.2	80° 50'.1	52'.8	94° 47'.1	01'.9	56° 15'.9	37'.7	277° 35'.2	31'.6
19	148° 48'.6	95° 49'.4	53'.6	109° 47'.8	02'.5	71° 17'.8	37'.8	292° 37'.8	31'.6
20	163° 51'.1	110° 48'.8	54'.4	124° 48'.4	03'.1	86° 19'.7	37'.8	307° 40'.5	31'.5
21	178° 53'.6	125° 48'.1	55'.3	139° 49'.1	03'.7	101° 21'.5	37'.9	322° 43'.1	31'.4
22	193° 56'.0	140° 47'.4	56'.1	154° 49'.7	04'.3	116° 23'.4	37'.9	337° 45'.7	31'.4
23	208° 58'.5	155° 46'.8	56'.9	169° 50'.4	04'.9	131° 25'.3	38'.0	352° 48'.4	31'.3
6 Monday 00	224° 01'.0	170° 46'.1	18° 57'.8 N	184° 51'.0	15° 05'.5 N	146° 27'.2	22° 38'.0 N	7° 51'.0	11° 31'.3 S
01	239° 03'.4	185° 45'.4	58'.6	199° 51'.7	06'.1	161° 29'.1	38'.1	22° 53'.7	31'.2
02	254° 05'.9	200° 44'.7	59'.4	214° 52'.4	06'.7	176° 31'.0	38'.1	37° 56'.3	31'.1
03	269° 08'.4	215° 44'.1	19° 00'.3 N	229° 53'.0	07'.3	191° 32'.9	38'.2	52° 59'.0	31'.1
04	284° 10'.8	230° 43'.4	01'.1	244° 53'.7	07'.9	206° 34'.8	38'.2	68° 01'.6	31'.0
05	299° 13'.3	245° 42'.7	01'.9	259° 54'.3	08'.5	221° 36'.7	38'.3	83° 04'.3	31'.0
06	314° 15'.7	260° 42'.1	02'.7	274° 55'.0	09'.1	236° 38'.6	38'.3	98° 06'.9	30'.9
07	329° 18'.2	275° 41'.4	03'.6	289° 55'.6	09'.7	251° 40'.5	38'.4	113° 09'.6	30'.9
08	344° 20'.7	290° 40'.7	04'.4	304° 56'.3	10'.3	266° 42'.4	38'.4	128° 12'.2	30'.8
09	359° 23'.1	305° 40'.0	05'.2	319° 57'.0	10'.8	281° 44'.3	38'.5	143° 14'.8	30'.7
10	14° 25'.6	320° 39'.4	06'.0	334° 57'.6	11'.4	296° 46'.2	38'.5	158° 17'.5	30'.7
11	29° 28'.1	335° 38'.7	06'.8	349° 58'.3	12'.0	311° 48'.1	38'.6	173° 20'.1	30'.6
12	44° 30'.5	350° 38'.0	19° 07'.7 N	4° 58'.9	15° 12'.6 N	326° 49'.9	22° 38'.6 N	188° 22'.8	11° 30'.6 S
13	59° 33'.0	5° 37'.3	08'.5	19° 59'.6	13'.2	341° 51'.8	38'.7	203° 25'.4	30'.5
14	74° 35'.5	20° 36'.6	09'.3	35° 00'.2	13'.8	356° 53'.7	38'.7	218° 28'.1	30'.5
15	89° 37'.9	35° 36'.0	10'.1	50° 00'.9	14'.4	11° 55'.6	38'.8	233° 30'.7	30'.4
16	104° 40'.4	50° 35'.3	10'.9	65° 01'.5	15'.0	26° 57'.5	38'.8	248° 33'.4	30'.3
17	119° 42'.9	65° 34'.6	11'.8	80° 02'.2	15'.6	41° 59'.4	38'.9	263° 36'.0	30'.3
18	134° 45'.3	80° 33'.9	12'.6	95° 02'.9	16'.2	57° 01'.3	38'.9	278° 38'.6	30'.2
19	149° 47'.8	95° 33'.2	13'.4	110° 03'.5	16'.7	72° 03'.2	39'.0	293° 41'.3	30'.2
20	164° 50'.2	110° 32'.6	14'.2	125° 04'.2	17'.3	87° 05'.1	39'.0	308° 43'.9	30'.1
21	179° 52'.7	125° 31'.9	15'.0	140° 04'.8	17'.9	102° 07'.0	39'.1	323° 46'.6	30'.1
22	194° 55'.2	140° 31'.2	15'.8	155° 05'.5	18'.5	117° 08'.9	39'.1	338° 49'.2	30'.0
23	209° 57'.6	155° 30'.5	16'.6	170° 06'.1	19'.1	132° 10'.8	39'.2	353° 51'.9	29'.9
	M.P. 09:02	v -0'.7	d 0'.8	v 0'.7	d 0'.6	v 1'.9	d 0'.1	v 2'.6	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.2 S
Achernar	335° 27'.4	57° 10'.1 S
Acrux	173° 08'.8	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.3	55° 53'.3 N
Alkaid	152° 58'.5	49° 14'.8 N
Alnair	27° 44'.0	46° 53'.5 S
Alnilam	275° 46'.7	1° 11'.9 S
Alphard	217° 56'.1	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.2 N
Alpheratz	357° 43'.8	29° 09'.7 N
Altair	62° 08'.2	8° 54'.2 N
Ankaa	353° 16'.2	42° 13'.9 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.7 N
Atria	107° 27'.4	69° 02'.8 S
Avior	234° 18'.1	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.5	52° 42'.6 S
Capella	280° 35'.0	46° 00'.6 N
Deneb	49° 31'.5	45° 19'.5 N
Denebola	182° 33'.5	14° 29'.7 N
Diphda	348° 56'.3	17° 54'.8 S
Dubhe	193° 51'.5	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.8	51° 29'.1 N
Enif	33° 47'.2	9° 56'.2 N
Fomalhaut	15° 24'.3	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.6 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.3 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.1 N
Markab	13° 38'.6	15° 16'.6 N
Menkar	314° 15'.5	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.2 S
Miaplacidus	221° 39'.6	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.4 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.3	56° 41'.1 S
Polaris	318° 16'.0	89° 19'.2 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.2 N
Rasalhague	96° 06'.3	12° 33'.0 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.4 S
Sabik	102° 12'.3	15° 44'.4 S
Schedar	349° 41'.0	56° 36'.5 N
Shaula	96° 21'.7	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.5	43° 29'.6 S
Vega	80° 38'.8	38° 47'.7 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	308° 00'.2	12:36
Mars	321° 33'.4	11:41
Jupiter	282° 39'.9	14:15
Saturn	143° 45'.7	23:29

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 48'.4	15° 56'.9 N	248° 49'.0	11'.8	5° 36'.7 S	11'.1	57'.6
195° 48'.4	57'.6	263° 19'.8	11'.9	25'.6	11'.1	
210° 48'.5	58'.3	277° 50'.7	11'.8	14'.5	11'.2	
225° 48'.5	59'.0	292° 21'.5	11'.9	03'.3	11'.2	57'.5
240° 48'.6	59'.8	306° 52'.4	12'.0	4° 52'.1 S	11'.2	
255° 48'.6	16° 00'.5 N	321° 23'.4	12'.0	40'.9	11'.2	
270° 48'.7	01'.2	335° 54'.4	12'.1	29'.7	11'.2	
285° 48'.8	01'.9	350° 25'.5	12'.1	18'.5	11'.2	57'.4
300° 48'.8	02'.6	4° 56'.6	12'.1	07'.3	11'.3	
315° 48'.9	03'.4	19° 27'.7	12'.2	3° 56'.0 S	11'.2	
330° 48'.9	04'.1	33° 58'.9	12'.2	44'.8	11'.3	
345° 49'.0	04'.8	48° 30'.1	12'.2	33'.5	11'.2	57'.3
0° 49'.0	16° 05'.5 N	63° 01'.3	12'.3	3° 22'.3 S	11'.3	57'.3
15° 49'.1	06'.2	77° 32'.6	12'.3	11'.0	11'.3	
30° 49'.1	07'.0	92° 03'.9	12'.4	2° 59'.7 S	11'.3	
45° 49'.2	07'.7	106° 35'.3	12'.4	48'.4	11'.3	57'.2
60° 49'.3	08'.4	121° 06'.7	12'.4	37'.1	11'.3	
75° 49'.3	09'.1	135° 38'.1	12'.5	25'.8	11'.3	
90° 49'.4	09'.8	150° 09'.6	12'.5	14'.5	11'.3	
105° 49'.4	10'.6	164° 41'.1	12'.5	03'.2	11'.3	57'.1
120° 49'.5	11'.3	179° 12'.6	12'.6	1° 51'.9 S	11'.3	
135° 49'.5	12'.0	193° 44'.2	12'.6	40'.6	11'.3	
150° 49'.6	12'.7	208° 15'.8	12'.6	29'.3	11'.3	
165° 49'.6	13'.4	222° 47'.4	12'.6	18'.0	11'.3	57'.0
180° 49'.7	16° 14'.1 N	237° 19'.0	12'.7	1° 06'.7 S	11'.3	57'.0
195° 49'.7	14'.8	251° 50'.7	12'.7	0° 55'.4 S	11'.2	
210° 49'.8	15'.6	266° 22'.4	12'.7	44'.2	11'.3	
225° 49'.8	16'.3	280° 54'.1	12'.8	32'.9	11'.3	56'.9
240° 49'.9	17'.0	295° 25'.9	12'.8	21'.6	11'.3	
255° 49'.9	17'.7	309° 57'.7	12'.8	10'.3	11'.2	
270° 50'.0	18'.4	324° 29'.5	12'.8	0° 00'.9 N	11'.3	
285° 50'.1	19'.1	339° 01'.3	12'.9	12'.2	11'.2	56'.8
300° 50'.1	19'.8	353° 33'.2	12'.8	23'.4	11'.3	
315° 50'.2	20'.5	8° 05'.0	12'.9	34'.7	11'.2	
330° 50'.2	21'.2	22° 36'.9	13'.0	45'.9	11'.2	
345° 50'.3	21'.9	37° 08'.9	12'.9	57'.1	11'.2	56'.7
0° 50'.3	16° 22'.7 N	51° 40'.8	13'.0	1° 08'.3 N	11'.2	56'.7
15° 50'.4	23'.4	66° 12'.8	12'.9	19'.5	11'.1	
30° 50'.4	24'.1	80° 44'.7	13'.0	30'.6	11'.2	
45° 50'.4	24'.8	95° 16'.7	13'.0	41'.8	11'.1	56'.6
60° 50'.5	25'.5	109° 48'.7	13'.1	52'.9	11'.1	
75° 50'.5	26'.2	124° 20'.8	13'.0	2° 04'.0 N	11'.1	
90° 50'.6	26'.9	138° 52'.8	13'.0	15'.1	11'.1	
105° 50'.6	27'.6	153° 24'.8	13'.1	26'.2	11'.1	
120° 50'.7	28'.3	167° 56'.9	13'.1	37'.3	11'.0	56'.5
135° 50'.7	29'.0	182° 29'.0	13'.1	48'.3	11'.0	
150° 50'.8	29'.7	197° 01'.1	13'.1	59'.3	11'.0	
165° 50'.8	30'.4	211° 33'.2	13'.1	3° 10'.3 N	11'.0	
180° 50'.9	16° 31'.1 N	226° 05'.3	13'.1	3° 21'.3 N	11'.0	56'.4
195° 50'.9	31'.8	240° 37'.4	13'.2	32'.3	10'.9	
210° 51'.0	32'.5	255° 09'.6	13'.1	43'.2	10'.9	
225° 51'.0	33'.2	269° 41'.7	13'.2	54'.1	10'.9	
240° 51'.1	33'.9	284° 13'.9	13'.1	4° 05'.0 N	10'.8	56'.3
255° 51'.1	34'.6	298° 46'.0	13'.2	15'.8	10'.9	
270° 51'.2	35'.3	313° 18'.2	13'.2	26'.7	10'.8	
285° 51'.2	36'.0	327° 50'.4	13'.2	37'.5	10'.7	
300° 51'.2	36'.7	342° 22'.6	13'.2	48'.2	10'.8	
315° 51'.3	37'.4	356° 54'.8	13'.2	59'.0	10'.7	56'.2
330° 51'.3	38'.1	11° 27'.0	13'.2	5° 09'.7 N	10'.6	
345° 51'.4	38'.8	25° 59'.2	13'.2	20'.3	10'.7	
0° 51'.4	16° 39'.5 N	40° 31'.4	13'.2	5° 31'.0 N	10'.6	56'.2
15° 51'.5	40'.2	55° 03'.6	13'.2	41'.6	10'.6	
30° 51'.5	40'.9	69° 35'.8	13'.2	52'.2	10'.5	56'.1
45° 51'.6	41'.6	84° 08'.0	13'.2	6° 02'.7 N	10'.5	
60° 51'.6	42'.3	98° 40'.2	13'.2	13'.2	10'.5	
75° 51'.6	43'.0	113° 12'.4	13'.2	23'.7	10'.4	
90° 51'.7	43'.7	127° 44'.6	13'.2	34'.1	10'.4	56'.0
105° 51'.7	44'.4	142° 16'.8	13'.2	44'.5	10'.4	
120° 51'.8	45'.1	156° 49'.0	13'.2	54'.9	10'.3	
135° 51'.8	45'.8	171° 21'.2	13'.2	7° 05'.2 N	10'.3	
150° 51'.8	46'.5	185° 53'.4	13'.2	15'.5	10'.2	
165° 51'.9	47'.1	200° 25'.6	13'.2	25'.7	10'.2	55'.9
SD 15'.9	d 0'.7	SD	15'.6	15'.5	15'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6
N 72°	-	-	01:12	02:36	02:25	02:15
N 70°	-	-	02:06	02:29	02:24	02:20
68°	-	-	02:38	02:23	02:23	02:24
66°	-	01:28	03:01	02:18	02:22	02:27
64°	-	02:05	03:20	02:13	02:22	02:30
62°	-	02:31	03:34	02:10	02:21	02:33
60°	01:18	02:51	03:47	02:06	02:21	02:35
N 58°	01:52	03:08	03:58	02:03	02:20	02:37
56°	02:16	03:21	04:07	02:01	02:20	02:39
54°	02:35	03:33	04:15	01:59	02:20	02:40
52°	02:51	03:43	04:23	01:56	02:19	02:42
50°	03:04	03:52	04:29	01:54	02:19	02:43
45°	03:30	04:11	04:44	01:50	02:19	02:46
N 40°	03:49	04:26	04:55	01:47	02:18	02:48
35°	04:05	04:38	05:05	01:44	02:18	02:51
30°	04:18	04:48	05:14	01:41	02:17	02:53
20°	04:38	05:05	05:29	01:36	02:17	02:56
N 10°	04:54	05:19	05:41	01:32	02:16	02:59
0°	05:07	05:32	05:53	01:28	02:15	03:02
S 10°	05:18	05:43	06:05	01:24	02:15	03:05
20°	05:28	05:55	06:17	01:20	02:14	03:08
30°	05:38	06:07	06:32	01:15	02:14	03:11
35°	05:43	06:13	06:40	01:13	02:14	03:13
40°	05:48	06:20	06:49	01:09	02:13	03:16
45°	05:53	06:29	07:00	01:06	02:13	03:18
S 50°	05:59	06:38	07:13	01:02	02:12	03:22
52°	06:02	06:42	07:19	01:00	02:12	03:23
54°	06:04	06:47	07:25	00:57	02:12	03:25
56°	06:07	06:52	07:33	00:55	02:12	03:27
58°	06:10	06:58	07:41	00:52	02:11	03:29
S 60°	06:14	07:04	07:51	00:49	02:11	03:31
S 62°	06:17	07:11	08:02	00:46	02:11	03:34

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 4	Moonset 5	Moonset 6
N 72°	22:52	-	-	13:09	14:58	16:45
N 70°	21:53	-	-	13:14	14:56	16:36
68°	21:19	-	-	13:18	14:54	16:28
66°	20:55	22:33	-	13:21	14:53	16:22
64°	20:36	21:52	-	13:24	14:51	16:17
62°	20:21	21:25	-	13:26	14:50	16:12
60°	20:08	21:04	22:42	13:28	14:49	16:08
N 58°	19:57	20:48	22:05	13:30	14:48	16:05
56°	19:48	20:34	21:40	13:32	14:47	16:02
54°	19:39	20:22	21:20	13:33	14:47	15:59
52°	19:32	20:12	21:04	13:34	14:46	15:56
50°	19:25	20:02	20:51	13:35	14:46	15:54
45°	19:11	19:44	20:25	13:38	14:44	15:49
N 40°	18:59	19:29	20:05	13:40	14:43	15:45
35°	18:49	19:16	19:49	13:42	14:42	15:42
30°	18:40	19:06	19:36	13:44	14:42	15:38
20°	18:25	18:48	19:16	13:46	14:40	15:33
N 10°	18:12	18:34	19:00	13:49	14:39	15:28
0°	18:00	18:22	18:47	13:51	14:38	15:24
S 10°	17:48	18:10	18:35	13:53	14:37	15:19
20°	17:36	17:59	18:25	13:55	14:35	15:15
30°	17:21	17:46	18:15	13:58	14:34	15:09
35°	17:13	17:40	18:10	14:00	14:33	15:06
40°	17:04	17:32	18:05	14:01	14:32	15:03
45°	16:53	17:24	17:59	14:03	14:31	14:58
S 50°	16:40	17:15	17:53	14:05	14:30	14:54
52°	16:34	17:10	17:51	14:06	14:29	14:51
54°	16:27	17:06	17:48	14:07	14:28	14:49
56°	16:20	17:01	17:45	14:09	14:28	14:46
58°	16:11	16:55	17:42	14:10	14:27	14:43
S 60°	16:02	16:48	17:39	14:12	14:26	14:40
S 62°	15:51	16:41	17:35	14:13	14:25	14:36

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
4	3 13	3 16	11:57	07:40	20:03	24d 29%
5	3 19	3 21	11:57	08:27	20:50	25d 20%
6	3 23	3 26	11:57	09:13	21:36	26d 12%

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2013 May 7, 8, 9 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.3		JUPITER -2.0		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
7 Tuesday 00	225° 00'.1	170° 29'.8	19° 17'.4 N	185° 06'.8	15° 19'.7 N	147° 12'.7	22° 39'.2 N	8° 54'.5	11° 29'.9 S
01	240° 02'.6	185° 29'.1	18'.2	200° 07'.4	20'.3	162° 14'.5	39'.3	23° 57'.2	29'.8
02	255° 05'.0	200° 28'.5	19'.1	215° 08'.1	20'.9	177° 16'.4	39'.3	38° 59'.8	29'.8
03	270° 07'.5	215° 27'.8	19'.9	230° 08'.8	21'.4	192° 18'.3	39'.4	54° 02'.5	29'.7
04	285° 10'.0	230° 27'.1	20'.7	245° 09'.4	22'.0	207° 20'.2	39'.4	69° 05'.1	29'.7
05	300° 12'.4	245° 26'.4	21'.5	260° 10'.1	22'.6	222° 22'.1	39'.5	84° 07'.7	29'.6
06	315° 14'.9	260° 25'.7	22'.3	275° 10'.7	23'.2	237° 24'.0	39'.5	99° 10'.4	29'.5
07	330° 17'.3	275° 25'.0	23'.1	290° 11'.4	23'.8	252° 25'.9	39'.6	114° 13'.0	29'.5
08	345° 19'.8	290° 24'.3	23'.9	305° 12'.0	24'.4	267° 27'.8	39'.6	129° 15'.7	29'.4
09	0° 22'.3	305° 23'.7	24'.7	320° 12'.7	25'.0	282° 29'.7	39'.7	144° 18'.3	29'.4
10	15° 24'.7	320° 23'.0	25'.5	335° 13'.3	25'.5	297° 31'.6	39'.7	159° 21'.0	29'.3
11	30° 27'.2	335° 22'.3	26'.3	350° 14'.0	26'.1	312° 33'.5	39'.8	174° 23'.6	29'.3
12	45° 29'.7	350° 21'.6	19° 27'.1 N	5° 14'.6	15° 26'.7 N	327° 35'.3	22° 39'.8 N	189° 26'.3	11° 29'.2 S
13	60° 32'.1	5° 20'.9	27'.9	20° 15'.3	27'.3	342° 37'.2	39'.9	204° 28'.9	29'.1
14	75° 34'.6	20° 20'.2	28'.7	35° 15'.9	27'.9	357° 39'.1	39'.9	219° 31'.5	29'.1
15	90° 37'.1	35° 19'.5	29'.5	50° 16'.6	28'.5	12° 41'.0	40'.0	234° 34'.2	29'.0
16	105° 39'.5	50° 18'.8	30'.3	65° 17'.3	29'.0	27° 42'.9	40'.0	249° 36'.8	29'.0
17	120° 42'.0	65° 18'.1	31'.1	80° 17'.9	29'.6	42° 44'.8	40'.1	264° 39'.5	28'.9
18	135° 44'.5	80° 17'.5	31'.8	95° 18'.6	30'.2	57° 46'.7	40'.1	279° 42'.1	28'.9
19	150° 46'.9	95° 16'.8	32'.6	110° 19'.2	30'.8	72° 48'.6	40'.2	294° 44'.8	28'.8
20	165° 49'.4	110° 16'.1	33'.4	125° 19'.9	31'.4	87° 50'.5	40'.2	309° 47'.4	28'.7
21	180° 51'.8	125° 15'.4	34'.2	140° 20'.5	32'.0	102° 52'.4	40'.3	324° 50'.1	28'.7
22	195° 54'.3	140° 14'.7	35'.0	155° 21'.2	32'.5	117° 54'.2	40'.3	339° 52'.7	28'.6
23	210° 56'.8	155° 14'.0	35'.8	170° 21'.8	33'.1	132° 56'.1	40'.4	354° 55'.3	28'.6
8 Wednesday 00	225° 59'.2	170° 13'.3	19° 36'.6 N	185° 22'.5	15° 33'.7 N	147° 58'.0	22° 40'.4 N	9° 58'.0	11° 28'.5 S
01	241° 01'.7	185° 12'.6	37'.4	200° 23'.1	34'.3	162° 59'.9	40'.5	25° 00'.6	28'.5
02	256° 04'.2	200° 11'.9	38'.2	215° 23'.8	34'.9	178° 01'.8	40'.5	40° 03'.3	28'.4
03	271° 06'.6	215° 11'.2	38'.9	230° 24'.4	35'.4	193° 03'.7	40'.6	55° 05'.9	28'.3
04	286° 09'.1	230° 10'.5	39'.7	245° 25'.1	36'.0	208° 05'.6	40'.6	70° 08'.6	28'.3
05	301° 11'.6	245° 09'.8	40'.5	260° 25'.7	36'.6	223° 07'.5	40'.7	85° 11'.2	28'.2
06	316° 14'.0	260° 09'.1	41'.3	275° 26'.4	37'.2	238° 09'.4	40'.7	100° 13'.9	28'.2
07	331° 16'.5	275° 08'.4	42'.1	290° 27'.1	37'.8	253° 11'.2	40'.8	115° 16'.5	28'.1
08	346° 18'.9	290° 07'.7	42'.9	305° 27'.7	38'.3	268° 13'.1	40'.8	130° 19'.1	28'.1
09	1° 21'.4	305° 07'.0	43'.6	320° 28'.4	38'.9	283° 15'.0	40'.9	145° 21'.8	28'.0
10	16° 23'.9	320° 06'.3	44'.4	335° 29'.0	39'.5	298° 16'.9	40'.9	160° 24'.4	27'.9
11	31° 26'.3	335° 05'.6	45'.2	350° 29'.7	40'.1	313° 18'.8	41'.0	175° 27'.1	27'.9
12	46° 28'.8	350° 04'.9	19° 46'.0 N	5° 30'.3	15° 40'.6 N	328° 20'.7	22° 41'.0 N	190° 29'.7	11° 27'.8 S
13	61° 31'.3	5° 04'.2	46'.7	20° 31'.0	41'.2	343° 22'.6	41'.0	205° 32'.4	27'.8
14	76° 33'.7	20° 03'.5	47'.5	35° 31'.6	41'.8	358° 24'.5	41'.1	220° 35'.0	27'.7
15	91° 36'.2	35° 02'.8	48'.3	50° 32'.3	42'.4	13° 26'.3	41'.1	235° 37'.6	27'.7
16	106° 38'.7	50° 02'.1	49'.1	65° 32'.9	43'.0	28° 28'.2	41'.2	250° 40'.3	27'.6
17	121° 41'.1	65° 01'.4	49'.8	80° 33'.6	43'.5	43° 30'.1	41'.2	265° 42'.9	27'.5
18	136° 43'.6	80° 00'.7	50'.6	95° 34'.2	44'.1	58° 32'.0	41'.3	280° 45'.6	27'.5
19	151° 46'.1	95° 00'.0	51'.4	110° 34'.9	44'.7	73° 33'.9	41'.3	295° 48'.2	27'.4
20	166° 48'.5	109° 59'.3	52'.1	125° 35'.5	45'.3	88° 35'.8	41'.4	310° 50'.9	27'.4
21	181° 51'.0	124° 58'.6	52'.9	140° 36'.2	45'.8	103° 37'.7	41'.4	325° 53'.5	27'.3
22	196° 53'.4	139° 57'.9	53'.7	155° 36'.8	46'.4	118° 39'.6	41'.5	340° 56'.1	27'.3
23	211° 55'.9	154° 57'.2	54'.4	170° 37'.5	47'.0	133° 41'.4	41'.5	355° 58'.8	27'.2
9 Thursday 00	226° 58'.4	169° 56'.5	19° 55'.2 N	185° 38'.1	15° 47'.6 N	148° 43'.3	22° 41'.6 N	11° 01'.4	11° 27'.2 S
01	242° 00'.8	184° 55'.8	56'.0	200° 38'.8	48'.1	163° 45'.2	41'.6	26° 04'.1	27'.1
02	257° 03'.3	199° 55'.1	56'.7	215° 39'.4	48'.7	178° 47'.1	41'.7	41° 06'.7	27'.0
03	272° 05'.8	214° 54'.4	57'.5	230° 40'.1	49'.3	193° 49'.0	41'.7	56° 09'.4	27'.0
04	287° 08'.2	229° 53'.6	58'.3	245° 40'.7	49'.8	208° 50'.9	41'.8	71° 12'.0	26'.9
05	302° 10'.7	244° 52'.9	59'.0	260° 41'.4	50'.4	223° 52'.8	41'.8	86° 14'.7	26'.9
06	317° 13'.2	259° 52'.2	59'.8	275° 42'.0	51'.0	238° 54'.6	41'.9	101° 17'.3	26'.8
07	332° 15'.6	274° 51'.5	20° 00'.5 N	290° 42'.7	51'.6	253° 56'.5	41'.9	116° 19'.9	26'.8
08	347° 18'.1	289° 50'.8	01'.3	305° 43'.3	52'.1	268° 58'.4	42'.0	131° 22'.6	26'.7
09	2° 20'.6	304° 50'.1	02'.1	320° 44'.0	52'.7	284° 00'.3	42'.0	146° 25'.2	26'.6
10	17° 23'.0	319° 49'.4	02'.8	335° 44'.6	53'.3	299° 02'.2	42'.1	161° 27'.9	26'.6
11	32° 25'.5	334° 48'.7	03'.6	350° 45'.3	53'.8	314° 04'.1	42'.1	176° 30'.5	26'.5
12	47° 27'.9	349° 48'.0	20° 04'.3 N	5° 45'.9	15° 54'.4 N	329° 06'.0	22° 42'.2 N	191° 33'.2	11° 26'.5 S
13	62° 30'.4	4° 47'.2	05'.1	20° 46'.6	55'.0	344° 07'.8	42'.2	206° 35'.8	26'.4
14	77° 32'.9	19° 46'.5	05'.8	35° 47'.2	55'.6	359° 09'.7	42'.3	221° 38'.4	26'.4
15	92° 35'.3	34° 45'.8	06'.6	50° 47'.9	56'.1	14° 11'.6	42'.3	236° 41'.1	26'.3
16	107° 37'.8	49° 45'.1	07'.3	65° 48'.5	56'.7	29° 13'.5	42'.4	251° 43'.7	26'.3
17	122° 40'.3	64° 44'.4	08'.1	80° 49'.2	57'.3	44° 15'.4	42'.4	266° 46'.4	26'.2
18	137° 42'.7	79° 43'.7	08'.8	95° 49'.8	57'.8	59° 17'.3	42'.4	281° 49'.0	26'.1
19	152° 45'.2	94° 43'.0	09'.6	110° 50'.5	58'.4	74° 19'.2	42'.5	296° 51'.6	26'.1
20	167° 47'.7	109° 42'.2	10'.3	125° 51'.1	59'.0	89° 21'.0	42'.5	311° 54'.3	26'.0
21	182° 50'.1	124° 41'.5	11'.1	140° 51'.8	59'.5	104° 22'.9	42'.6	326° 56'.9	26'.0
22	197° 52'.6	139° 40'.8	11'.8	155° 52'.4	16° 00'.1 N	119° 24'.8	42'.6	341° 59'.6	25'.9
23	212° 55'.0	154° 40'.1	12'.6	170° 53'.1	00'.7	134° 26'.7	42'.7	357° 02'.2	25'.9
	M.P. 08:51	v -0'.7	d 0'.8	v 0'.7	d 0'.6	v 1'.9	d 0'.0	v 2'.6	d 0'.1

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 18'.8	40° 15'.2 S	180° 51'.9	16° 47'.8 N	214° 57'.8	13'.2	7° 35'.9 N	10'.2	55'.9
Achernar	335° 27'.4	57° 10'.1 S	195° 52'.0	48'.5	229° 30'.0	13'.2	46'.1	10'.1	
Acrux	173° 08'.8	63° 10'.7 S	210° 52'.0	49'.2	244° 02'.2	13'.1	56'.2	10'.1	
Adhara	255° 12'.8	28° 59'.8 S	225° 52'.0	49'.9	258° 34'.3	13'.2	8° 06'.3 N	10'.0	
Aldebaran	290° 49'.8	16° 32'.0 N	240° 52'.1	50'.6	273° 06'.5	13'.2	16'.3	10'.0	55'.8
			255° 52'.1	51'.3	287° 38'.7	13'.2	26'.3	9'.9	
Alioth	166° 20'.3	55° 53'.3 N	270° 52'.2	52'.0	302° 10'.9	13'.1	36'.2	9'.9	
Alkaid	152° 58'.5	49° 14'.8 N	285° 52'.2	52'.7	316° 43'.0	13'.2	46'.1	9'.9	
Alnair	27° 44'.0	46° 53'.5 S	300° 52'.2	53'.3	331° 15'.2	13'.1	56'.0	9'.8	
Alnilam	275° 46'.7	1° 11'.9 S	315° 52'.3	54'.0	345° 47'.3	13'.1	9° 05'.8 N	9'.7	55'.7
Alphard	217° 56'.2	8° 43'.3 S	330° 52'.3	54'.7	0° 19'.4	13'.2	15'.5	9'.7	
			345° 52'.4	55'.4	14° 51'.6	13'.1	25'.2	9'.7	
Alphecca	126° 10'.7	26° 40'.2 N	0° 52'.4	16° 56'.1 N	29° 23'.7	13'.1	9° 34'.9 N	9'.6	55'.7
Alpheratz	357° 43'.8	29° 09'.7 N	15° 52'.4	56'.8	43° 55'.8	13'.1	44'.5	9'.5	
Altair	62° 08'.2	8° 54'.3 N	30° 52'.5	57'.5	58° 27'.9	13'.1	54'.0	9'.5	55'.6
Ankaa	353° 16'.1	42° 13'.9 S	45° 52'.5	58'.1	73° 00'.0	13'.0	10° 03'.5 N	9'.5	
Antares	112° 26'.0	26° 27'.6 S	60° 52'.5	58'.8	87° 32'.0	13'.1	13'.0	9'.4	
			75° 52'.6	59'.5	102° 04'.1	13'.0	22'.4	9'.3	
Arcturus	145° 55'.5	19° 06'.7 N	90° 52'.6	17° 00'.2 N	116° 36'.1	13'.1	31'.7	9'.3	
Atria	107° 27'.4	69° 02'.9 S	105° 52'.7	00'.9	131° 08'.2	13'.0	41'.0	9'.2	55'.5
Avior	234° 18'.2	59° 33'.6 S	120° 52'.7	01'.6	145° 40'.2	13'.0	50'.2	9'.2	
Bellatrix	278° 32'.4	6° 21'.5 N	135° 52'.7	02'.2	160° 12'.2	13'.0	59'.4	9'.1	
Betelgeuse	271° 01'.6	7° 24'.3 N	150° 52'.8	02'.9	174° 44'.2	13'.0	11° 08'.5 N	9'.1	
			165° 52'.8	03'.6	189° 16'.2	13'.0	17'.6	9'.0	
Canopus	263° 56'.6	52° 42'.6 S	180° 52'.8	17° 04'.3 N	203° 48'.2	13'.0	11° 26'.6 N	9'.0	55'.5
Capella	280° 35'.0	46° 00'.6 N	195° 52'.9	05'.0	218° 20'.2	12'.9	35'.6	8'.8	55'.4
Deneb	49° 31'.4	45° 19'.5 N	210° 52'.9	05'.6	232° 52'.1	12'.9	44'.4	8'.9	
Denebola	182° 33'.5	14° 29'.7 N	225° 52'.9	06'.3	247° 24'.0	12'.9	53'.3	8'.8	
Diphda	348° 56'.2	17° 54'.8 S	240° 53'.0	07'.0	261° 55'.9	13'.0	12° 02'.1 N	8'.7	
			255° 53'.0	07'.7	276° 27'.9	12'.8	10'.8	8'.6	
Dubhe	193° 51'.6	61° 40'.8 N	270° 53'.0	08'.3	290° 59'.7	12'.9	19'.4	8'.6	55'.3
Elnath	278° 13'.0	28° 37'.0 N	285° 53'.1	09'.0	305° 31'.6	12'.9	28'.0	8'.5	
Eltanin	90° 45'.8	51° 29'.2 N	300° 53'.1	09'.7	320° 03'.5	12'.8	36'.5	8'.5	
Enif	33° 47'.2	9° 56'.2 N	315° 53'.1	10'.4	334° 35'.3	12'.8	45'.0	8'.4	
Fomalhaut	15° 24'.2	29° 32'.9 S	330° 53'.2	11'.0	349° 07'.1	12'.8	53'.4	8'.3	
			345° 53'.2	11'.7	3° 38'.9	12'.8	13° 01'.7 N	8'.3	
Gacrux	172° 00'.5	57° 11'.6 S	0° 53'.2	17° 12'.4 N	18° 10'.7	12'.8	13° 10'.0 N	8'.2	55'.2
Gienah	175° 52'.1	17° 37'.2 S	15° 53'.3	13'.1	32° 42'.5	12'.8	18'.2	8'.1	
Hadar	148° 47'.3	60° 26'.4 S	30° 53'.3	13'.7	47° 14'.3	12'.7	26'.3	8'.1	
Hamal	328° 01'.2	23° 31'.4 N	45° 53'.3	14'.4	61° 46'.0	12'.7	34'.4	8'.0	
Kaus Aust.	83° 43'.6	34° 22'.5 S	60° 53'.3	15'.1	76° 17'.7	12'.7	42'.4	8'.0	
			75° 53'.4	15'.8	90° 49'.4	12'.7	50'.4	7'.8	
Kochab	137° 18'.9	74° 06'.1 N	90° 53'.4	16'.4	105° 21'.1	12'.7	58'.2	7'.8	55'.1
Markab	13° 38'.6	15° 16'.6 N	105° 53'.4	17'.1	119° 52'.8	12'.7	14° 06'.0 N	7'.8	
Menkar	314° 15'.5	4° 08'.4 N	120° 53'.5	17'.8	134° 24'.5	12'.6	13'.8	7'.6	
Menkent	148° 07'.3	36° 26'.2 S	135° 53'.5	18'.4	148° 56'.1	12'.6	21'.4	7'.6	
Miaplacidus	221° 39'.7	69° 46'.8 S	150° 53'.5	19'.1	163° 27'.7	12'.6	29'.0	7'.5	
			165° 53'.6	19'.8	177° 59'.3	12'.6	36'.5	7'.5	
Mirfak	308° 40'.9	49° 54'.4 N	180° 53'.6	17° 20'.4 N	192° 30'.9	12'.6	14° 44'.0 N	7'.3	55'.0
Nunki	75° 58'.2	26° 16'.6 S	195° 53'.6	21'.1	207° 02'.5	12'.5	51'.3	7'.3	
Peacock	53° 19'.3	56° 41'.1 S	210° 53'.6	21'.8	221° 34'.0	12'.6	58'.6	7'.3	
Polaris	318° 15'.7	89° 19'.2 N	225° 53'.7	22'.4	236° 05'.6	12'.5	15° 05'.9 N	7'.1	
Pollux	243° 28'.0	27° 59'.5 N	240° 53'.7	23'.1	250° 37'.1	12'.5	13'.0	7'.1	
			255° 53'.7	23'.8	265° 08'.6	12'.4	20'.1	7'.0	
Procyon	245° 00'.0	5° 11'.2 N	270° 53'.8	24'.4	279° 40'.0	12'.5	27'.1	6'.9	54'.9
Rasalhague	96° 06'.3	12° 33'.0 N	285° 53'.8	25'.1	294° 11'.5	12'.4	34'.0	6'.9	
Regulus	207° 43'.5	11° 53'.9 N	300° 53'.8	25'.8	308° 42'.9	12'.5	40'.9	6'.8	
Rigel	281° 12'.4	8° 11'.4 S	315° 53'.8	26'.4	323° 14'.4	12'.4	47'.7	6'.7	
Rigil Kent	139° 51'.1	60° 53'.4 S	330° 53'.9	27'.1	337° 45'.8	12'.4	54'.4	6'.6	
			345° 53'.9	27'.7	352° 17'.2	12'.3	16° 01'.0 N	6'.5	
Sabik	102° 12'.3	15° 44'.4 S	0° 53'.9	17° 28'.4 N	6° 48'.5	12'.4	16° 07'.5 N	6'.5	54'.9
Schedar	349° 41'.0	56° 36'.5 N	15° 53'.9	29'.1	21° 19'.9	12'.3	14'.0	6'.4	54'.8
Shaula	96° 21'.7	37° 06'.6 S	30° 54'.0	29'.7	35° 51'.2	12'.3	20'.4	6'.3	
Sirius	258° 34'.0	16° 44'.4 S	45° 54'.0	30'.4	50° 22'.5	12'.3	26'.7	6'.2	
Spica	158° 31'.0	11° 14'.0 S	60° 54'.0	31'.0	64° 53'.8	12'.3	32'.9	6'.2	
			75° 54'.0	31'.7	79° 25'.1	12'.3	39'.1	6'.0	
Suhail	222° 52'.5	43° 29'.6 S	90° 54'.1	32'.4	93° 56'.4	12'.2	45'.1	6'.0	
Vega	80° 38'.7	38° 47'.7 N	105° 54'.1	33'.0	108° 27'.6	12'.3	51'.1	5'.9	54'.7
Zuben'ubi	137° 05'.2	16° 05'.9 S	120° 54'.1	33'.7	122° 58'.9	12'.2	57'.0	5'.8	
			135° 54'.1	34'.3	137° 30'.1	12'.2	17° 02'.8 N	5'.8	
	SHA	Mer.Pass.	150° 54'.2	35'.0	152° 01'.3	12'.2	08'.6	5'.6	
Venus	304° 14'.1	12:40	165° 54'.2	35'.6	166° 32'.5	12'.1	14'.2	5'.6	
Mars	319° 23'.2	11:38							
Jupiter	281° 58'.8	14:06							
Saturn	143° 58'.8	23:16	SD 15'.8	d 0'.7	SD	15'.2	15'.1	14'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9
N 72°	-	-	00:20	02:04	01:51	01:35
N 70°	-	-	01:45	02:15	02:11	02:06
68°	-	-	02:23	02:24	02:26	02:29
66°	-	01:02	02:49	02:32	02:39	02:48
64°	-	01:50	03:10	02:39	02:49	03:02
62°	-	02:20	03:26	02:44	02:58	03:15
60°	00:55	02:42	03:39	02:49	03:06	03:26
N 58°	01:39	02:59	03:51	02:54	03:13	03:35
56°	02:06	03:14	04:01	02:58	03:19	03:43
54°	02:26	03:26	04:10	03:01	03:24	03:50
52°	02:43	03:37	04:17	03:05	03:29	03:57
50°	02:57	03:47	04:24	03:07	03:34	04:03
45°	03:25	04:06	04:39	03:14	03:43	04:15
N 40°	03:45	04:22	04:52	03:19	03:51	04:26
35°	04:01	04:35	05:02	03:24	03:58	04:35
30°	04:15	04:46	05:11	03:28	04:05	04:43
20°	04:36	05:04	05:27	03:35	04:15	04:57
N 10°	04:53	05:18	05:40	03:42	04:25	05:09
0°	05:06	05:31	05:53	03:48	04:34	05:20
S 10°	05:18	05:43	06:05	03:54	04:43	05:32
20°	05:29	05:56	06:19	04:00	04:52	05:44
30°	05:40	06:08	06:33	04:08	05:03	05:58
35°	05:45	06:15	06:42	04:12	05:10	06:07
40°	05:51	06:23	06:52	04:17	05:17	06:16
45°	05:57	06:32	07:03	04:23	05:26	06:27
S 50°	06:03	06:42	07:17	04:29	05:36	06:41
52°	06:06	06:47	07:23	04:33	05:41	06:47
54°	06:09	06:52	07:31	04:36	05:46	06:54
56°	06:12	06:57	07:38	04:40	05:52	07:02
58°	06:16	07:03	07:47	04:44	05:59	07:10
S 60°	06:19	07:10	07:58	04:49	06:06	07:21
S 62°	06:23	07:18	08:10	04:55	06:15	07:32

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 7	Moonset 8	Moonset 9
N 72°	-	-	-	18:34	20:28	22:38
N 70°	22:14	-	-	18:16	19:57	21:40
68°	21:34	-	-	18:02	19:35	21:06
66°	21:06	23:00	-	17:51	19:18	20:42
64°	20:46	22:07	-	17:41	19:04	20:23
62°	20:29	21:37	-	17:33	18:52	20:07
60°	20:15	21:14	23:06	17:26	18:42	19:54
N 58°	20:04	20:56	22:19	17:20	18:33	19:43
56°	19:53	20:41	21:50	17:15	18:26	19:34
54°	19:45	20:28	21:29	17:10	18:19	19:25
52°	19:37	20:17	21:12	17:05	18:13	19:17
50°	19:29	20:08	20:57	17:01	18:07	19:11
45°	19:14	19:48	20:30	16:53	17:55	18:56
N 40°	19:02	19:32	20:09	16:46	17:46	18:44
35°	18:51	19:19	19:52	16:40	17:37	18:34
30°	18:42	19:08	19:39	16:35	17:30	18:25
20°	18:26	18:50	19:17	16:25	17:17	18:09
N 10°	18:13	18:35	19:01	16:17	17:06	17:56
0°	18:00	18:22	18:47	16:10	16:56	17:43
S 10°	17:47	18:09	18:35	16:02	16:46	17:31
20°	17:34	17:57	18:24	15:54	16:35	17:17
30°	17:19	17:44	18:13	15:45	16:23	17:02
35°	17:11	17:37	18:07	15:40	16:15	16:53
40°	17:01	17:29	18:02	15:34	16:07	16:43
45°	16:49	17:21	17:56	15:27	15:58	16:31
S 50°	16:35	17:10	17:49	15:19	15:46	16:17
52°	16:29	17:06	17:46	15:15	15:41	16:11
54°	16:22	17:01	17:43	15:11	15:35	16:03
56°	16:14	16:55	17:40	15:06	15:29	15:55
58°	16:05	16:49	17:37	15:01	15:21	15:46
S 60°	15:54	16:42	17:33	14:55	15:13	15:35
S 62°	15:43	16:34	17:29	14:49	15:04	15:23

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
7	3 28	3 30	11:57	09:59	22:22	27d 6%
8	3 31	3 33	11:56	10:45	23:08	28d 2%
9	3 34	3 36	11:56	11:32	23:56	29d 0%

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2013 May 10, 11, 12 (Fri, Sat, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.3		JUPITER -2.0		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
10 Friday 00	227° 57'.5	169° 39'.4	20° 13'.3 N	185° 53'.7	16° 01'.2 N	149° 28'.6	22° 42'.7 N	12° 04'.9	11° 25'.8 S
01	243° 00'.0	184° 38'.7	14'.0	200° 54'.4	01'.8	164° 30'.5	42'.8	27° 07'.5	25'.7
02	258° 02'.4	199° 37'.9	14'.8	215° 55'.0	02'.4	179° 32'.3	42'.8	42° 10'.1	25'.7
03	273° 04'.9	214° 37'.2	15'.5	230° 55'.7	02'.9	194° 34'.2	42'.9	57° 12'.8	25'.6
04	288° 07'.4	229° 36'.5	16'.3	245° 56'.3	03'.5	209° 36'.1	42'.9	72° 15'.4	25'.6
05	303° 09'.8	244° 35'.8	17'.0	260° 57'.0	04'.1	224° 38'.0	43'.0	87° 18'.1	25'.5
06	318° 12'.3	259° 35'.1	17'.7	275° 57'.6	04'.6	239° 39'.9	43'.0	102° 20'.7	25'.5
07	333° 14'.8	274° 34'.3	18'.5	290° 58'.3	05'.2	254° 41'.8	43'.1	117° 23'.4	25'.4
08	348° 17'.2	289° 33'.6	19'.2	305° 58'.9	05'.8	269° 43'.6	43'.1	132° 26'.0	25'.4
09	3° 19'.7	304° 32'.9	19'.9	320° 59'.6	06'.3	284° 45'.5	43'.2	147° 28'.6	25'.3
10	18° 22'.2	319° 32'.2	20'.7	336° 00'.2	06'.9	299° 47'.4	43'.2	162° 31'.3	25'.2
11	33° 24'.6	334° 31'.5	21'.4	351° 00'.9	07'.5	314° 49'.3	43'.3	177° 33'.9	25'.2
12	48° 27'.1	349° 30'.7	20° 22'.1 N	6° 01'.5	16° 08'.0 N	329° 51'.2	22° 43'.3 N	192° 36'.6	11° 25'.1 S
13	63° 29'.5	4° 30'.0	22'.9	21° 02'.2	08'.6	344° 53'.1	43'.4	207° 39'.2	25'.1
14	78° 32'.0	19° 29'.3	23'.6	36° 02'.8	09'.2	359° 54'.9	43'.4	222° 41'.8	25'.0
15	93° 34'.5	34° 28'.6	24'.3	51° 03'.5	09'.7	14° 56'.8	43'.4	237° 44'.5	25'.0
16	108° 36'.9	49° 27'.8	25'.1	66° 04'.1	10'.3	29° 58'.7	43'.5	252° 47'.1	24'.9
17	123° 39'.4	64° 27'.1	25'.8	81° 04'.8	10'.8	45° 00'.6	43'.5	267° 49'.8	24'.9
18	138° 41'.9	79° 26'.4	26'.5	96° 05'.4	11'.4	60° 02'.5	43'.6	282° 52'.4	24'.8
19	153° 44'.3	94° 25'.7	27'.2	111° 06'.1	12'.0	75° 04'.4	43'.6	297° 55'.1	24'.7
20	168° 46'.8	109° 24'.9	28'.0	126° 06'.7	12'.5	90° 06'.2	43'.7	312° 57'.7	24'.7
21	183° 49'.3	124° 24'.2	28'.7	141° 07'.3	13'.1	105° 08'.1	43'.7	328° 00'.3	24'.6
22	198° 51'.7	139° 23'.5	29'.4	156° 08'.0	13'.7	120° 10'.0	43'.8	343° 03'.0	24'.6
23	213° 54'.2	154° 22'.7	30'.1	171° 08'.6	14'.2	135° 11'.9	43'.8	358° 05'.6	24'.5
11 Saturday 00	228° 56'.7	169° 22'.0	20° 30'.8 N	186° 09'.3	16° 14'.8 N	150° 13'.8	22° 43'.9 N	13° 08'.3	11° 24'.5 S
01	243° 59'.1	184° 21'.3	31'.6	201° 09'.9	15'.3	165° 15'.7	43'.9	28° 10'.9	24'.4
02	259° 01'.6	199° 20'.6	32'.3	216° 10'.6	15'.9	180° 17'.5	44'.0	43° 13'.5	24'.4
03	274° 04'.0	214° 19'.8	33'.0	231° 11'.2	16'.5	195° 19'.4	44'.0	58° 16'.2	24'.3
04	289° 06'.5	229° 19'.1	33'.7	246° 11'.9	17'.0	210° 21'.3	44'.1	73° 18'.8	24'.2
05	304° 09'.0	244° 18'.4	34'.4	261° 12'.5	17'.6	225° 23'.2	44'.1	88° 21'.5	24'.2
06	319° 11'.4	259° 17'.6	35'.1	276° 13'.2	18'.1	240° 25'.1	44'.1	103° 24'.1	24'.1
07	334° 13'.9	274° 16'.9	35'.9	291° 13'.8	18'.7	255° 26'.9	44'.2	118° 26'.7	24'.1
08	349° 16'.4	289° 16'.2	36'.6	306° 14'.5	19'.3	270° 28'.8	44'.2	133° 29'.4	24'.0
09	4° 18'.8	304° 15'.4	37'.3	321° 15'.1	19'.8	285° 30'.7	44'.3	148° 32'.0	24'.0
10	19° 21'.3	319° 14'.7	38'.0	336° 15'.8	20'.4	300° 32'.6	44'.3	163° 34'.7	23'.9
11	34° 23'.8	334° 14'.0	38'.7	351° 16'.4	20'.9	315° 34'.5	44'.4	178° 37'.3	23'.9
12	49° 26'.2	349° 13'.2	20° 39'.4 N	6° 17'.0	16° 21'.5 N	330° 36'.3	22° 44'.4 N	193° 39'.9	11° 23'.8 S
13	64° 28'.7	4° 12'.5	40'.1	21° 17'.7	22'.0	345° 38'.2	44'.5	208° 42'.6	23'.8
14	79° 31'.2	19° 11'.8	40'.8	36° 18'.3	22'.6	0° 40'.1	44'.5	223° 45'.2	23'.7
15	94° 33'.6	34° 11'.0	41'.5	51° 19'.0	23'.2	15° 42'.0	44'.6	238° 47'.9	23'.6
16	109° 36'.1	49° 10'.3	42'.2	66° 19'.6	23'.7	30° 43'.9	44'.6	253° 50'.5	23'.6
17	124° 38'.5	64° 09'.6	42'.9	81° 20'.3	24'.3	45° 45'.8	44'.7	268° 53'.2	23'.5
18	139° 41'.0	79° 08'.8	43'.6	96° 20'.9	24'.8	60° 47'.6	44'.7	283° 55'.8	23'.5
19	154° 43'.5	94° 08'.1	44'.3	111° 21'.6	25'.4	75° 49'.5	44'.8	298° 58'.4	23'.4
20	169° 45'.9	109° 07'.3	45'.0	126° 22'.2	25'.9	90° 51'.4	44'.8	314° 01'.1	23'.4
21	184° 48'.4	124° 06'.6	45'.7	141° 22'.9	26'.5	105° 53'.3	44'.8	329° 03'.7	23'.3
22	199° 50'.9	139° 05'.9	46'.4	156° 23'.5	27'.0	120° 55'.2	44'.9	344° 06'.3	23'.3
23	214° 53'.3	154° 05'.1	47'.1	171° 24'.1	27'.6	135° 57'.0	44'.9	359° 09'.0	23'.2
12 Sunday 00	229° 55'.8	169° 04'.4	20° 47'.8 N	186° 24'.8	16° 28'.1 N	150° 58'.9	22° 45'.0 N	14° 11'.6	11° 23'.2 S
01	244° 58'.3	184° 03'.6	48'.5	201° 25'.4	28'.7	166° 00'.8	45'.0	29° 14'.3	23'.1
02	260° 00'.7	199° 02'.9	49'.2	216° 26'.1	29'.3	181° 02'.7	45'.1	44° 16'.9	23'.0
03	275° 03'.2	214° 02'.2	49'.9	231° 26'.7	29'.8	196° 04'.6	45'.1	59° 19'.5	23'.0
04	290° 05'.6	229° 01'.4	50'.6	246° 27'.4	30'.4	211° 06'.4	45'.2	74° 22'.2	22'.9
05	305° 08'.1	244° 00'.7	51'.3	261° 28'.0	30'.9	226° 08'.3	45'.2	89° 24'.8	22'.9
06	320° 10'.6	258° 59'.9	52'.0	276° 28'.7	31'.5	241° 10'.2	45'.3	104° 27'.5	22'.8
07	335° 13'.0	273° 59'.2	52'.7	291° 29'.3	32'.0	256° 12'.1	45'.3	119° 30'.1	22'.8
08	350° 15'.5	288° 58'.4	53'.4	306° 30'.0	32'.6	271° 13'.9	45'.4	134° 32'.7	22'.7
09	5° 18'.0	303° 57'.7	54'.0	321° 30'.6	33'.1	286° 15'.8	45'.4	149° 35'.4	22'.7
10	20° 20'.4	318° 57'.0	54'.7	336° 31'.2	33'.7	301° 17'.7	45'.4	164° 38'.0	22'.6
11	35° 22'.9	333° 56'.2	55'.4	351° 31'.9	34'.2	316° 19'.6	45'.5	179° 40'.7	22'.5
12	50° 25'.4	348° 55'.5	20° 56'.1 N	6° 32'.5	16° 34'.8 N	331° 21'.5	22° 45'.5 N	194° 43'.3	11° 22'.5 S
13	65° 27'.8	3° 54'.7	56'.8	21° 33'.2	35'.3	346° 23'.3	45'.6	209° 45'.9	22'.4
14	80° 30'.3	18° 54'.0	57'.5	36° 33'.8	35'.9	1° 25'.2	45'.6	224° 48'.6	22'.4
15	95° 32'.8	33° 53'.2	58'.1	51° 34'.5	36'.4	16° 27'.1	45'.7	239° 51'.2	22'.3
16	110° 35'.2	48° 52'.5	58'.8	66° 35'.1	37'.0	31° 29'.0	45'.7	254° 53'.9	22'.3
17	125° 37'.7	63° 51'.7	59'.5	81° 35'.8	37'.5	46° 30'.9	45'.8	269° 56'.5	22'.2
18	140° 40'.1	78° 51'.0	21° 00'.2 N	96° 36'.4	38'.1	61° 32'.7	45'.8	284° 59'.1	22'.2
19	155° 42'.6	93° 50'.2	00'.9	111° 37'.0	38'.6	76° 34'.6	45'.9	300° 01'.8	22'.1
20	170° 45'.1	108° 49'.5	01'.5	126° 37'.7	39'.2	91° 36'.5	45'.9	315° 04'.4	22'.1
21	185° 47'.5	123° 48'.7	02'.2	141° 38'.3	39'.7	106° 38'.4	45'.9	330° 07'.1	22'.0
22	200° 50'.0	138° 48'.0	02'.9	156° 39'.0	40'.3	121° 40'.2	46'.0	345° 09'.7	22'.0
23	215° 52'.5	153° 47'.2	03'.6	171° 39'.6	40'.8	136° 42'.1	46'.0	0° 12'.3	21'.9
	M.P. 08:39	v -0'.7	d 0'.7	v 0'.6	d 0'.6	v 1'.9	d 0'.0	v 2'.6	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.8	40° 15'.2 S
Achernar	335° 27'.4	57° 10'.0 S
Acrux	173° 08'.8	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.3 N
Alkaid	152° 58'.5	49° 14'.8 N
Alnair	27° 43'.9	46° 53'.5 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.2 N
Alpheratz	357° 43'.8	29° 09'.7 N
Altair	62° 08'.2	8° 54'.3 N
Ankaa	353° 16'.1	42° 13'.9 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.3	69° 02'.9 S
Avior	234° 18'.2	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.6	52° 42'.5 S
Capella	280° 35'.0	46° 00'.6 N
Deneb	49° 31'.4	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.7 N
Diphda	348° 56'.2	17° 54'.8 S
Dubhe	193° 51'.6	61° 40'.8 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.7	51° 29'.2 N
Enif	33° 47'.2	9° 56'.2 N
Fomalhaut	15° 24'.2	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.6 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.4 S
Hamal	328° 01'.2	23° 31'.4 N
Kaus Aust.	83° 43'.6	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.1 N
Markab	13° 38'.5	15° 16'.6 N
Menkar	314° 15'.5	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 39'.7	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.4 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.1 S
Polaris	318° 15'.3	89° 19'.2 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.2	12° 33'.0 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.4 S
Sabik	102° 12'.3	15° 44'.4 S
Schedar	349° 41'.0	56° 36'.4 N
Shaula	96° 21'.7	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.5	43° 29'.6 S
Vega	80° 38'.7	38° 47'.7 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	300° 25'.4	12:43
Mars	317° 12'.6	11:35
Jupiter	281° 17'.1	13:57
Saturn	144° 11'.6	23:03

SUN			
GHA	Dec		
180° 54'.2	17° 36'.3 N		
195° 54'.2	37'.0		
210° 54'.2	37'.6		
225° 54'.3	38'.3		
240° 54'.3	38'.9		
255° 54'.3	39'.6		
270° 54'.3	40'.2		
285° 54'.4	40'.9		
300° 54'.4	41'.5		
315° 54'.4	42'.2		
330° 54'.4	42'.8		
345° 54'.4	43'.5		
0° 54'.5	17° 44'.1 N		
15° 54'.5	44'.8		
30° 54'.5	45'.4		
45° 54'.5	46'.1		
60° 54'.5	46'.7		
75° 54'.5	47'.4		
90° 54'.6	48'.0		
105° 54'.6	48'.6		
120° 54'.6	49'.3		
135° 54'.6	49'.9		
150° 54'.6	50'.6		
165° 54'.7	51'.2		
180° 54'.7	17° 51'.9 N		
195° 54'.7	52'.5		
210° 54'.7	53'.2		
225° 54'.7	53'.8		
240° 54'.7	54'.4		
255° 54'.8	55'.1		
270° 54'.8	55'.7		
285° 54'.8	56'.4		
300° 54'.8	57'.0		
315° 54'.8	57'.6		
330° 54'.8	58'.3		
345° 54'.8	58'.9		
0° 54'.9	17° 59'.5 N		
15° 54'.9	18° 00'.2 N		
30° 54'.9	00'.8		
45° 54'.9	01'.4		
60° 54'.9	02'.1		
75° 54'.9	02'.7		
90° 54'.9	03'.3		
105° 54'.9	04'.0		
120° 55'.0	04'.6		
135° 55'.0	05'.2		
150° 55'.0	05'.9		
165° 55'.0	06'.5		
180° 55'.0	18° 07'.1 N		
195° 55'.0	07'.8		
210° 55'.0	08'.4		
225° 55'.0	09'.0		
240° 55'.0	09'.7		
255° 55'.1	10'.3		
270° 55'.1	10'.9		
285° 55'.1	11'.5		
300° 55'.1	12'.2		
315° 55'.1	12'.8		
330° 55'.1	13'.4		
345° 55'.1	14'.0		
0° 55'.1	18° 14'.7 N		
15° 55'.1	15'.3		
30° 55'.1	15'.9		
45° 55'.1	16'.5		
60° 55'.1	17'.1		
75° 55'.1	17'.8		
90° 55'.2	18'.4		
105° 55'.2	19'.0		
120° 55'.2	19'.6		
135° 55'.2	20'.2		
150° 55'.2	20'.9		
165° 55'.2	21'.5		
SD 15'.8	d 0'.6		

MOON				
GHA	v	Dec	d	HP
181° 03'.6	12'.2	17° 19'.8 N	5'.5	54'.7
195° 34'.8	12'.1	25'.3	5'.4	
210° 05'.9	12'.2	30'.7	5'.3	
224° 37'.1	12'.1	36'.0	5'.2	54'.6
239° 08'.2	12'.1	41'.2	5'.2	
253° 39'.3	12'.0	46'.4	5'.0	
268° 10'.3	12'.1	51'.4	5'.0	
282° 41'.4	12'.0	56'.4	4'.9	
297° 12'.4	12'.1	18° 01'.3 N	4'.8	
311° 43'.5	12'.0	06'.1	4'.7	
326° 14'.5	12'.0	10'.8	4'.7	54'.5
340° 45'.5	12'.0	15'.5	4'.5	
355° 16'.5	12'.0	18° 20'.0 N	4'.5	54'.5
9° 47'.5	12'.0	24'.5	4'.3	
24° 18'.5	11'.9	28'.8	4'.3	
38° 49'.4	12'.0	33'.1	4'.2	
53° 20'.4	11'.9	37'.3	4'.1	
67° 51'.3	11'.9	41'.4	4'.0	
82° 22'.2	11'.9	45'.4	3'.9	
96° 53'.1	11'.9	49'.3	3'.8	54'.4
111° 24'.0	11'.9	53'.1	3'.8	
125° 54'.9	11'.9	56'.9	3'.6	
140° 25'.8	11'.9	19° 00'.5 N	3'.6	
154° 56'.7	11'.9	04'.1	3'.4	
169° 27'.6	11'.8	19° 07'.5 N	3'.4	54'.4
183° 58'.4	11'.9	10'.9	3'.3	
198° 29'.3	11'.8	14'.2	3'.2	
213° 00'.1	11'.8	17'.4	3'.1	
227° 30'.9	11'.9	20'.5	3'.0	54'.3
242° 01'.8	11'.8	23'.5	2'.9	
256° 32'.6	11'.8	26'.4	2'.8	
271° 03'.4	11'.8	29'.2	2'.7	
285° 34'.2	11'.8	31'.9	2'.7	
300° 05'.0	11'.8	34'.6	2'.5	
314° 35'.8	11'.8	37'.1	2'.5	
329° 06'.6	11'.8	39'.6	2'.3	
343° 37'.4	11'.8	19° 41'.9 N	2'.3	54'.3
358° 08'.2	11'.8	44'.2	2'.2	
12° 39'.0	11'.8	46'.4	2'.0	54'.2
27° 09'.8	11'.8	48'.4	2'.0	
41° 40'.6	11'.7	50'.4	1'.9	
56° 11'.3	11'.8	52'.3	1'.8	
70° 42'.1	11'.8	54'.1	1'.7	
85° 12'.9	11'.8	55'.8	1'.6	
99° 43'.7	11'.8	57'.4	1'.5	
114° 14'.5	11'.7	58'.9	1'.4	
128° 45'.2	11'.8	20° 00'.3 N	1'.3	
143° 16'.0	11'.8	01'.6	1'.3	
157° 46'.8	11'.8	20° 02'.9 N	1'.1	54'.2
172° 17'.6	11'.8	04'.0	1'.0	
186° 48'.4	11'.8	05'.0	1'.0	
201° 19'.2	11'.8	06'.0	0'.8	
215° 50'.0	11'.8	06'.8	0'.8	54'.1
230° 20'.8	11'.8	07'.6	0'.7	
244° 51'.6	11'.8	08'.3	0'.5	
259° 22'.4	11'.8	08'.8	0'.5	
273° 53'.2	11'.8	09'.3	0'.4	
288° 24'.0	11'.9	09'.7	0'.3	
302° 54'.9	11'.8	10'.0	0'.2	
317° 25'.7	11'.8	10'.2	0'.1	
331° 56'.5	11'.9	20° 10'.3 N	0'.0	54'.1
346° 27'.4	11'.8	10'.3	0'.1	
0° 58'.2	11'.9	10'.2	0'.2	
15° 29'.1	11'.9	10'.0	0'.3	
30° 00'.0	11'.9	09'.7	0'.4	
44° 30'.9	11'.9	09'.3	0'.4	
59° 01'.8	11'.9	08'.9	0'.6	
73° 32'.7	11'.9	08'.3	0'.7	
88° 03'.6	11'.9	07'.6	0'.7	
102° 34'.5	12'.0	06'.9	0'.8	
117° 05'.5	11'.9	06'.1	1'.0	
131° 36'.4	12'.0	05'.1	1'.0	
SD 14'.9	14'.8	14'.7		

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12
N 72°	-	-	-	01:03	-	-
N 70°	-	-	01:22	02:02	01:56	01:40
68°	-	-	02:08	02:36	02:50	03:18
66°	-	00:21	02:38	03:01	03:23	03:57
64°	-	01:33	03:00	03:21	03:47	04:24
62°	-	02:07	03:17	03:37	04:06	04:45
60°	00:19	02:32	03:32	03:50	04:22	05:02
N 58°	01:24	02:51	03:44	04:02	04:35	05:16
56°	01:55	03:06	03:55	04:12	04:47	05:29
54°	02:18	03:20	04:04	04:21	04:57	05:39
52°	02:36	03:31	04:12	04:28	05:06	05:49
50°	02:51	03:41	04:20	04:36	05:14	05:57
45°	03:20	04:02	04:36	04:51	05:31	06:16
N 40°	03:41	04:18	04:49	05:04	05:45	06:30
35°	03:58	04:32	05:00	05:14	05:57	06:43
30°	04:12	04:43	05:09	05:24	06:07	06:54
20°	04:34	05:02	05:26	05:40	06:26	07:13
N 10°	04:52	05:18	05:40	05:55	06:41	07:29
0°	05:06	05:31	05:53	06:08	06:56	07:44
S 10°	05:18	05:44	06:06	06:21	07:11	08:00
20°	05:30	05:57	06:20	06:36	07:27	08:16
30°	05:41	06:10	06:35	06:53	07:45	08:35
35°	05:47	06:18	06:44	07:02	07:56	08:46
40°	05:53	06:26	06:55	07:13	08:08	08:59
45°	06:00	06:35	07:07	07:26	08:22	09:14
S 50°	06:07	06:46	07:21	07:42	08:40	09:32
52°	06:10	06:51	07:28	07:50	08:48	09:41
54°	06:13	06:56	07:36	07:58	08:58	09:50
56°	06:17	07:02	07:44	08:08	09:08	10:01
58°	06:21	07:09	07:54	08:18	09:20	10:14
S 60°	06:25	07:16	08:05	08:31	09:34	10:28
S 62°	06:29	07:24	08:17	08:45	09:51	10:46

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 10	Moonset 11	Moonset 12
N 72°	-	-	-	-	-	-
N 70°	22:39	-	-	23:25	-	26:01
68°	21:49	-	-	22:32	23:44	24:33
66°	21:18	-	-	21:59	23:05	23:54
64°	20:55	22:25	-	21:36	22:38	23:27
62°	20:38	21:49	-	21:17	22:17	23:06
60°	20:23	21:24	-	21:01	22:00	22:49
N 58°	20:10	21:04	22:34	20:48	21:46	22:35
56°	19:59	20:48	22:01	20:37	21:34	22:23
54°	19:50	20:34	21:37	20:27	21:23	22:12
52°	19:41	20:23	21:19	20:18	21:14	22:03
50°	19:34	20:13	21:04	20:10	21:05	21:54
45°	19:18	19:52	20:34	19:54	20:47	21:36
N 40°	19:05	19:35	20:12	19:40	20:33	21:21
35°	18:54	19:21	19:55	19:28	20:20	21:09
30°	18:44	19:10	19:41	19:18	20:09	20:58
20°	18:27	18:51	19:19	19:01	19:51	20:39
N 10°	18:13	18:35	19:01	18:45	19:35	20:23
0°	18:00	18:22	18:47	18:31	19:19	20:08
S 10°	17:47	18:09	18:34	18:17	19:04	19:52
20°	17:33	17:56	18:23	18:02	18:48	19:36
30°	17:17	17:42	18:11	17:44	18:29	19:17
35°	17:08	17:35	18:05	17:34	18:19	19:06
40°	16:58	17:26	17:59	17:23	18:06	18:53
45°	16:46	17:17	17:53	17:09	17:51	18:38
S 50°	16:31	17:06	17:45	16:53	17:34	18:20
52°	16:24	17:01	17:42	16:45	17:25	18:12
54°	16:16	16:56	17:39	16:36	17:16	18:02
56°	16:08	16:50	17:35	16:27	17:05	17:51
58°	15:58	16:43	17:31	16:16	16:53	17:38
S 60°	15:47	16:36	17:27	16:03	16:39	17:24
S 62°	15:35	16:27	17:23	15:48	16:22	17:06

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
10	3 37	3 38	11:56	12:20	24:44	0d 0%
11	3 39	3 39	11:56	13:08	00:44	1d 2%
12	3 40	3 40	11:56	13:56	01:32	2d 6%

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2013 May 13, 14, 15 (Mon, Tue, Wed)

GMT	ARIES	VENUS -3.9		MARS +1.3		JUPITER -1.9		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
13 Monday 00	230° 54'.9	168° 46'.5	21° 04'.2 N	186° 40'.3	16° 41'.3 N	151° 44'.0	22° 46'.1 N	15° 15'.0	11° 21'.8 S
01	245° 57'.4	183° 45'.7	04'.9	201° 40'.9	41'.9	166° 45'.9	46'.1	30° 17'.6	21'.8
02	260° 59'.9	198° 45'.0	05'.6	216° 41'.5	42'.4	181° 47'.8	46'.2	45° 20'.2	21'.7
03	276° 02'.3	213° 44'.2	06'.2	231° 42'.2	43'.0	196° 49'.6	46'.2	60° 22'.9	21'.7
04	291° 04'.8	228° 43'.5	06'.9	246° 42'.8	43'.5	211° 51'.5	46'.3	75° 25'.5	21'.6
05	306° 07'.3	243° 42'.7	07'.6	261° 43'.5	44'.1	226° 53'.4	46'.3	90° 28'.2	21'.6
06	321° 09'.7	258° 42'.0	08'.3	276° 44'.1	44'.6	241° 55'.3	46'.4	105° 30'.8	21'.5
07	336° 12'.2	273° 41'.2	08'.9	291° 44'.8	45'.2	256° 57'.1	46'.4	120° 33'.4	21'.5
08	351° 14'.6	288° 40'.5	09'.6	306° 45'.4	45'.7	271° 59'.0	46'.4	135° 36'.1	21'.4
09	6° 17'.1	303° 39'.7	10'.2	321° 46'.0	46'.3	287° 00'.9	46'.5	150° 38'.7	21'.4
10	21° 19'.6	318° 39'.0	10'.9	336° 46'.7	46'.8	302° 02'.8	46'.5	165° 41'.4	21'.3
11	36° 22'.0	333° 38'.2	11'.6	351° 47'.3	47'.3	317° 04'.7	46'.6	180° 44'.0	21'.3
12	51° 24'.5	348° 37'.4	21° 12'.2 N	6° 48'.0	16° 47'.9 N	332° 06'.5	22° 46'.6 N	195° 46'.6	11° 21'.2 S
13	66° 27'.0	3° 36'.7	12'.9	21° 48'.6	48'.4	347° 08'.4	46'.7	210° 49'.3	21'.1
14	81° 29'.4	18° 35'.9	13'.5	36° 49'.3	49'.0	2° 10'.3	46'.7	225° 51'.9	21'.1
15	96° 31'.9	33° 35'.2	14'.2	51° 49'.9	49'.5	17° 12'.2	46'.8	240° 54'.5	21'.0
16	111° 34'.4	48° 34'.4	14'.9	66° 50'.5	50'.1	32° 14'.0	46'.8	255° 57'.2	21'.0
17	126° 36'.8	63° 33'.7	15'.5	81° 51'.2	50'.6	47° 15'.9	46'.9	270° 59'.8	20'.9
18	141° 39'.3	78° 32'.9	16'.2	96° 51'.8	51'.1	62° 17'.8	46'.9	286° 02'.5	20'.9
19	156° 41'.8	93° 32'.1	16'.8	111° 52'.5	51'.7	77° 19'.7	46'.9	301° 05'.1	20'.8
20	171° 44'.2	108° 31'.4	17'.5	126° 53'.1	52'.2	92° 21'.5	47'.0	316° 07'.7	20'.8
21	186° 46'.7	123° 30'.6	18'.1	141° 53'.7	52'.8	107° 23'.4	47'.0	331° 10'.4	20'.7
22	201° 49'.1	138° 29'.9	18'.8	156° 54'.4	53'.3	122° 25'.3	47'.1	346° 13'.0	20'.7
23	216° 51'.6	153° 29'.1	19'.4	171° 55'.0	53'.8	137° 27'.2	47'.1	1° 15'.6	20'.6
14 Tuesday 00	231° 54'.1	168° 28'.3	21° 20'.1 N	186° 55'.7	16° 54'.4 N	152° 29'.0	22° 47'.2 N	16° 18'.3	11° 20'.6 S
01	246° 56'.5	183° 27'.6	20'.7	201° 56'.3	54'.9	167° 30'.9	47'.2	31° 20'.9	20'.5
02	261° 59'.0	198° 26'.8	21'.4	216° 57'.0	55'.5	182° 32'.8	47'.3	46° 23'.6	20'.4
03	277° 01'.5	213° 26'.0	22'.0	231° 57'.6	56'.0	197° 34'.7	47'.3	61° 26'.2	20'.4
04	292° 03'.9	228° 25'.3	22'.7	246° 58'.2	56'.5	212° 36'.5	47'.3	76° 28'.8	20'.3
05	307° 06'.4	243° 24'.5	23'.3	261° 58'.9	57'.1	227° 38'.4	47'.4	91° 31'.5	20'.3
06	322° 08'.9	258° 23'.8	23'.9	276° 59'.5	57'.6	242° 40'.3	47'.4	106° 34'.1	20'.2
07	337° 11'.3	273° 23'.0	24'.6	292° 00'.2	58'.1	257° 42'.2	47'.5	121° 36'.7	20'.2
08	352° 13'.8	288° 22'.2	25'.2	307° 00'.8	58'.7	272° 44'.0	47'.5	136° 39'.4	20'.1
09	7° 16'.2	303° 21'.5	25'.9	322° 01'.4	59'.2	287° 45'.9	47'.6	151° 42'.0	20'.1
10	22° 18'.7	318° 20'.7	26'.5	337° 02'.1	59'.8	302° 47'.8	47'.6	166° 44'.6	20'.0
11	37° 21'.2	333° 19'.9	27'.1	352° 02'.7	17° 00'.3 N	317° 49'.7	47'.7	181° 47'.3	20'.0
12	52° 23'.6	348° 19'.2	21° 27'.8 N	7° 03'.4	17° 00'.8 N	332° 51'.5	22° 47'.7 N	196° 49'.9	11° 19'.9 S
13	67° 26'.1	3° 18'.4	28'.4	22° 04'.0	01'.4	347° 53'.4	47'.7	211° 52'.6	19'.9
14	82° 28'.6	18° 17'.6	29'.0	37° 04'.6	01'.9	2° 55'.3	47'.8	226° 55'.2	19'.8
15	97° 31'.0	33° 16'.9	29'.7	52° 05'.3	02'.4	17° 57'.2	47'.8	241° 57'.8	19'.8
16	112° 33'.5	48° 16'.1	30'.3	67° 05'.9	03'.0	32° 59'.0	47'.9	257° 00'.5	19'.7
17	127° 36'.0	63° 15'.3	30'.9	82° 06'.6	03'.5	48° 00'.9	47'.9	272° 03'.1	19'.6
18	142° 38'.4	78° 14'.5	31'.6	97° 07'.2	04'.0	63° 02'.8	48'.0	287° 05'.7	19'.6
19	157° 40'.9	93° 13'.8	32'.2	112° 07'.8	04'.6	78° 04'.7	48'.0	302° 08'.4	19'.5
20	172° 43'.4	108° 13'.0	32'.8	127° 08'.5	05'.1	93° 06'.5	48'.1	317° 11'.0	19'.5
21	187° 45'.8	123° 12'.2	33'.4	142° 09'.1	05'.6	108° 08'.4	48'.1	332° 13'.6	19'.4
22	202° 48'.3	138° 11'.5	34'.1	157° 09'.8	06'.2	123° 10'.3	48'.1	347° 16'.3	19'.4
23	217° 50'.7	153° 10'.7	34'.7	172° 10'.4	06'.7	138° 12'.2	48'.2	2° 18'.9	19'.3
15 Wednesday 00	232° 53'.2	168° 09'.9	21° 35'.3 N	187° 11'.0	17° 07'.2 N	153° 14'.0	22° 48'.2 N	17° 21'.6	11° 19'.3 S
01	247° 55'.7	183° 09'.2	35'.9	202° 11'.7	07'.8	168° 15'.9	48'.3	32° 24'.2	19'.2
02	262° 58'.1	198° 08'.4	36'.6	217° 12'.3	08'.3	183° 17'.8	48'.3	47° 26'.8	19'.2
03	278° 00'.6	213° 07'.6	37'.2	232° 13'.0	08'.8	198° 19'.7	48'.4	62° 29'.5	19'.1
04	293° 03'.1	228° 06'.8	37'.8	247° 13'.6	09'.4	213° 21'.5	48'.4	77° 32'.1	19'.1
05	308° 05'.5	243° 06'.1	38'.4	262° 14'.2	09'.9	228° 23'.4	48'.4	92° 34'.7	19'.0
06	323° 08'.0	258° 05'.3	39'.0	277° 14'.9	10'.4	243° 25'.3	48'.5	107° 37'.4	19'.0
07	338° 10'.5	273° 04'.5	39'.6	292° 15'.5	11'.0	258° 27'.1	48'.5	122° 40'.0	18'.9
08	353° 12'.9	288° 03'.7	40'.3	307° 16'.2	11'.5	273° 29'.0	48'.6	137° 42'.6	18'.9
09	8° 15'.4	303° 03'.0	40'.9	322° 16'.8	12'.0	288° 30'.9	48'.6	152° 45'.3	18'.8
10	23° 17'.9	318° 02'.2	41'.5	337° 17'.4	12'.5	303° 32'.8	48'.7	167° 47'.9	18'.7
11	38° 20'.3	333° 01'.4	42'.1	352° 18'.1	13'.1	318° 34'.6	48'.7	182° 50'.5	18'.7
12	53° 22'.8	348° 00'.6	21° 42'.7 N	7° 18'.7	17° 13'.6 N	333° 36'.5	22° 48'.8 N	197° 53'.2	11° 18'.6 S
13	68° 25'.2	2° 59'.9	43'.3	22° 19'.3	14'.1	348° 38'.4	48'.8	212° 55'.8	18'.6
14	83° 27'.7	17° 59'.1	43'.9	37° 20'.0	14'.7	3° 40'.3	48'.8	227° 58'.4	18'.5
15	98° 30'.2	32° 58'.3	44'.5	52° 20'.6	15'.2	18° 42'.1	48'.9	243° 01'.1	18'.5
16	113° 32'.6	47° 57'.5	45'.1	67° 21'.3	15'.7	33° 44'.0	48'.9	258° 03'.7	18'.4
17	128° 35'.1	62° 56'.7	45'.8	82° 21'.9	16'.2	48° 45'.9	49'.0	273° 06'.4	18'.4
18	143° 37'.6	77° 56'.0	46'.4	97° 22'.5	16'.8	63° 47'.7	49'.0	288° 09'.0	18'.3
19	158° 40'.0	92° 55'.2	47'.0	112° 23'.2	17'.3	78° 49'.6	49'.1	303° 11'.6	18'.3
20	173° 42'.5	107° 54'.4	47'.6	127° 23'.8	17'.8	93° 51'.5	49'.1	318° 14'.3	18'.2
21	188° 45'.0	122° 53'.6	48'.2	142° 24'.4	18'.3	108° 53'.4	49'.1	333° 16'.9	18'.2
22	203° 47'.4	137° 52'.8	48'.8	157° 25'.1	18'.9	123° 55'.2	49'.2	348° 19'.5	18'.1
23	218° 49'.9	152° 52'.1	49'.4	172° 25'.7	19'.4	138° 57'.1	49'.2	3° 22'.2	18'.1
	M.P. 08:27	v -0'.8	d 0'.6	v 0'.6	d 0'.5	v 1'.9	d 0'.0	v 2'.6	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.1 S
Achernar	335° 27'.4	57° 10'.0 S
Acrux	173° 08'.8	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.3 N
Alkaid	152° 58'.5	49° 14'.9 N
Alnair	27° 43'.9	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.2 N
Alpheratz	357° 43'.8	29° 09'.7 N
Altair	62° 08'.1	8° 54'.3 N
Ankaa	353° 16'.1	42° 13'.8 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.3	69° 02'.9 S
Avior	234° 18'.2	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.3 N
Canopus	263° 56'.6	52° 42'.5 S
Capella	280° 35'.0	46° 00'.6 N
Deneb	49° 31'.4	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.7 N
Diphda	348° 56'.2	17° 54'.8 S
Dubhe	193° 51'.6	61° 40'.9 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.7	51° 29'.2 N
Enif	33° 47'.2	9° 56'.2 N
Fomalhaut	15° 24'.2	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.6 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.4 S
Hamal	328° 01'.1	23° 31'.4 N
Kaus Aust.	83° 43'.6	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.1 N
Markab	13° 38'.5	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.4 N
Menkent	148° 07'.2	36° 26'.3 S
Miaplacidus	221° 39'.7	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.4 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.1 S
Polaris	318° 14'.8	89° 19'.2 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.2	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.3	15° 44'.4 S
Schedar	349° 41'.0	56° 36'.4 N
Shaula	96° 21'.6	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.5	43° 29'.6 S
Vega	80° 38'.7	38° 47'.7 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	296° 34'.3	12:47
Mars	315° 01'.6	11:32
Jupiter	280° 35'.0	13:48
Saturn	144° 24'.2	22:51

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
13 00	180° 55'.2	18° 22'.1 N	146° 07'.4	12'.0	20° 04'.1 N	1'.1	54'.1
01	195° 55'.2	22'.7	160° 38'.4	11'.9	03'.0	1'.2	54'.0
02	210° 55'.2	23'.3	175° 09'.3	12'.1	01'.8	1'.3	
03	225° 55'.2	24'.0	189° 40'.4	12'.0	00'.5	1'.4	
04	240° 55'.2	24'.6	204° 11'.4	12'.0	19° 59'.1 N	1'.5	
05	255° 55'.2	25'.2	218° 42'.4	12'.1	57'.6	1'.6	
06	270° 55'.2	25'.8	233° 13'.5	12'.0	56'.0	1'.7	
07	285° 55'.2	26'.4	247° 44'.5	12'.1	54'.3	1'.7	
08	300° 55'.2	27'.0	262° 15'.6	12'.1	52'.6	1'.9	
09	315° 55'.2	27'.6	276° 46'.7	12'.1	50'.7	1'.9	
10	330° 55'.2	28'.2	291° 17'.8	12'.1	48'.8	2'.1	
11	345° 55'.2	28'.9	305° 48'.9	12'.2	46'.7	2'.1	
12	0° 55'.2	18° 29'.5 N	320° 20'.1	12'.1	19° 44'.6 N	2'.2	54'.0
13	15° 55'.2	30'.1	334° 51'.2	12'.2	42'.4	2'.3	
14	30° 55'.2	30'.7	349° 22'.4	12'.2	40'.1	2'.4	
15	45° 55'.2	31'.3	3° 53'.6	12'.2	37'.7	2'.5	
16	60° 55'.2	31'.9	18° 24'.8	12'.3	35'.2	2'.6	
17	75° 55'.2	32'.5	32° 56'.1	12'.2	32'.6	2'.7	
18	90° 55'.2	33'.1	47° 27'.3	12'.3	29'.9	2'.7	
19	105° 55'.2	33'.7	61° 58'.6	12'.3	27'.2	2'.9	
20	120° 55'.2	34'.3	76° 29'.9	12'.3	24'.3	2'.9	
21	135° 55'.2	34'.9	91° 01'.2	12'.3	21'.4	3'.0	
22	150° 55'.2	35'.5	105° 32'.5	12'.4	18'.4	3'.1	
23	165° 55'.2	36'.2	120° 03'.9	12'.3	15'.3	3'.2	
14 00	180° 55'.2	18° 36'.8 N	134° 35'.2	12'.4	19° 12'.1 N	3'.3	54'.0
01	195° 55'.2	37'.4	149° 06'.6	12'.4	08'.8	3'.4	
02	210° 55'.2	38'.0	163° 38'.0	12'.5	05'.4	3'.4	
03	225° 55'.2	38'.6	178° 09'.5	12'.4	02'.0	3'.6	54'.1
04	240° 55'.2	39'.2	192° 40'.9	12'.5	18° 58'.4 N	3'.6	
05	255° 55'.2	39'.8	207° 12'.4	12'.5	54'.8	3'.7	
06	270° 55'.2	40'.4	221° 43'.9	12'.5	51'.1	3'.8	
07	285° 55'.2	41'.0	236° 15'.4	12'.6	47'.3	3'.9	
08	300° 55'.2	41'.6	250° 47'.0	12'.5	43'.4	4'.0	
09	315° 55'.2	42'.2	265° 18'.5	12'.6	39'.4	4'.0	
10	330° 55'.2	42'.8	279° 50'.1	12'.6	35'.4	4'.2	
11	345° 55'.2	43'.4	294° 21'.7	12'.6	31'.2	4'.2	
12	0° 55'.2	18° 44'.0 N	308° 53'.3	12'.7	18° 27'.0 N	4'.3	54'.1
13	15° 55'.2	44'.6	323° 25'.0	12'.6	22'.7	4'.4	
14	30° 55'.2	45'.2	337° 56'.6	12'.7	18'.3	4'.5	
15	45° 55'.2	45'.8	352° 28'.3	12'.8	13'.8	4'.5	
16	60° 55'.2	46'.4	7° 00'.1	12'.7	09'.3	4'.6	
17	75° 55'.2	46'.9	21° 31'.8	12'.8	04'.7	4'.8	
18	90° 55'.2	47'.5	36° 03'.6	12'.7	17° 59'.9 N	4'.8	
19	105° 55'.2	48'.1	50° 35'.3	12'.9	55'.1	4'.8	
20	120° 55'.2	48'.7	65° 07'.2	12'.8	50'.3	5'.0	
21	135° 55'.2	49'.3	79° 39'.0	12'.8	45'.3	5'.0	
22	150° 55'.2	49'.9	94° 10'.8	12'.9	40'.3	5'.2	54'.2
23	165° 55'.1	50'.5	108° 42'.7	12'.9	35'.1	5'.2	
15 00	180° 55'.1	18° 51'.1 N	123° 14'.6	12'.9	17° 29'.9 N	5'.2	54'.2
01	195° 55'.1	51'.7	137° 46'.5	13'.0	24'.7	5'.4	
02	210° 55'.1	52'.3	152° 18'.5	12'.9	19'.3	5'.4	
03	225° 55'.1	52'.9	166° 50'.4	13'.0	13'.9	5'.5	
04	240° 55'.1	53'.5	181° 22'.4	13'.0	08'.4	5'.6	
05	255° 55'.1	54'.0	195° 54'.4	13'.1	02'.8	5'.7	
06	270° 55'.1	54'.6	210° 26'.5	13'.0	16° 57'.1 N	5'.8	
07	285° 55'.1	55'.2	224° 58'.5	13'.1	51'.3	5'.8	
08	300° 55'.1	55'.8	239° 30'.6	13'.1	45'.5	5'.9	
09	315° 55'.1	56'.4	254° 02'.7	13'.1	39'.6	5'.9	54'.3
10	330° 55'.1	57'.0	268° 34'.8	13'.2	33'.7	6'.1	
11	345° 55'.1	57'.6	283° 07'.0	13'.1	27'.6	6'.1	
12	0° 55'.0	18° 58'.2 N	297° 39'.1	13'.2	16° 21'.5 N	6'.2	54'.3
13	15° 55'.0	58'.7	312° 11'.3	13'.2	15'.3	6'.3	
14	30° 55'.0	59'.3	326° 43'.5	13'.3	09'.0	6'.3	
15	45° 55'.0	59'.9	341° 15'.8	13'.2	02'.7	6'.4	
16	60° 55'.0	19° 00'.5 N	355° 48'.0	13'.3	15° 56'.3 N	6'.5	
17	75° 55'.0	01'.1	10° 20'.3	13'.3	49'.8	6'.6	
18	90° 55'.0	01'.6	24° 52'.6	13'.3	43'.2	6'.6	54'.4
19	105° 55'.0	02'.2	39° 24'.9	13'.3	36'.6	6'.7	
20	120° 55'.0	02'.8	53° 57'.2	13'.4	29'.9	6'.8	
21	135° 54'.9	03'.4	68° 29'.6	13'.4	23'.1	6'.8	
22	150° 54'.9	04'.0	83° 02'.0	13'.4	16'.3	6'.9	
23	165° 54'.9	04'.5	97° 34'.4	13'.4	09'.4	7'.0	
	SD 15'.8	d 0'.6	SD	14'.7	14'.7	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 13	Moonrise 14	Moonrise 15
N 72°	-	-	-	-	-	05:19
N 70°	-	-	00:52	02:41	04:31	06:14
68°	-	-	01:52	04:09	05:22	06:47
66°	-	-	02:26	04:48	05:54	07:10
64°	-	01:14	02:50	05:15	06:17	07:29
62°	-	01:55	03:09	05:35	06:36	07:44
60°	-	02:22	03:24	05:52	06:51	07:57
N 58°	01:07	02:43	03:38	06:06	07:04	08:08
56°	01:44	02:59	03:49	06:18	07:15	08:17
54°	02:09	03:14	03:59	06:29	07:25	08:26
52°	02:28	03:26	04:08	06:39	07:34	08:33
50°	02:44	03:36	04:15	06:47	07:42	08:40
45°	03:15	03:58	04:32	07:05	07:58	08:55
N 40°	03:37	04:15	04:46	07:19	08:12	09:06
35°	03:55	04:29	04:57	07:32	08:23	09:17
30°	04:10	04:41	05:07	07:43	08:33	09:25
20°	04:33	05:01	05:24	08:01	08:51	09:41
N 10°	04:51	05:17	05:39	08:17	09:06	09:54
0°	05:06	05:31	05:53	08:32	09:20	10:06
S 10°	05:19	05:44	06:06	08:47	09:34	10:19
20°	05:31	05:58	06:21	09:04	09:49	10:32
30°	05:43	06:12	06:37	09:22	10:06	10:47
35°	05:49	06:20	06:47	09:33	10:16	10:56
40°	05:56	06:28	06:57	09:45	10:27	11:06
45°	06:03	06:38	07:10	10:00	10:41	11:17
S 50°	06:10	06:50	07:25	10:18	10:57	11:31
52°	06:14	06:55	07:33	10:26	11:05	11:38
54°	06:17	07:01	07:41	10:35	11:13	11:45
56°	06:21	07:07	07:50	10:46	11:23	11:53
58°	06:25	07:14	08:00	10:58	11:34	12:02
S 60°	06:30	07:22	08:11	11:12	11:46	12:13
S 62°	06:35	07:31	08:25	11:29	12:01	12:25

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 13	Moonset 14	Moonset 15
N 72°	-	-	-	-	-	02:40
N 70°	23:14	-	-	02:01	01:50	01:45
68°	22:05	-	-	00:33	00:59	01:11
66°	21:30	-	-	-	00:26	00:47
64°	21:05	22:45	-	-	00:03	00:27
62°	20:46	22:01	-	23:44	-	00:12
60°	20:30	21:33	-	23:28	23:58	24:22
N 58°	20:17	21:12	22:52	23:15	23:47	24:13
56°	20:05	20:55	22:12	23:04	23:37	24:05
54°	19:55	20:41	21:46	22:54	23:29	23:58
52°	19:46	20:28	21:26	22:45	23:21	23:51
50°	19:38	20:18	21:10	22:37	23:14	23:45
45°	19:21	19:55	20:39	22:20	22:58	23:33
N 40°	19:08	19:38	20:16	22:06	22:46	23:22
35°	18:56	19:24	19:58	21:54	22:35	23:13
30°	18:46	19:12	19:43	21:44	22:26	23:05
20°	18:29	18:52	19:20	21:26	22:10	22:52
N 10°	18:14	18:36	19:02	21:10	21:56	22:40
0°	18:00	18:22	18:47	20:55	21:42	22:28
S 10°	17:46	18:08	18:34	20:41	21:29	22:17
20°	17:32	17:55	18:22	20:25	21:15	22:05
30°	17:15	17:41	18:09	20:07	20:58	21:51
35°	17:06	17:33	18:03	19:56	20:49	21:43
40°	16:55	17:24	17:57	19:44	20:38	21:33
45°	16:42	17:14	17:50	19:30	20:25	21:22
S 50°	16:27	17:02	17:42	19:12	20:09	21:09
52°	16:19	16:57	17:38	19:04	20:02	21:03
54°	16:11	16:51	17:35	18:55	19:53	20:56
56°	16:03	16:45	17:31	18:44	19:44	20:48
58°	15:52	16:38	17:26	18:32	19:34	20:40
S 60°	15:41	16:30	17:22	18:19	19:21	20:30
S 62°	15:27	16:21	17:17	18:02	19:07	20:18

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
13	3 41	3 41	11:56	14:44	02:20	3d 11%
14	3 41	3 41	11:56	15:31	03:08	4d 17%
15	3 41	3 40	11:56	16:17	03:54	5d 25%

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2013 May 16, 17, 18 (Thur, Fri, Saw)

GMT	ARIES	VENUS -3.9		MARS +1.3		JUPITER -1.9		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
16 Thursday 00	233° 52'.4	167° 51'.3	21° 50'.0 N	187° 26'.4	17° 19'.9 N	153° 59'.0	22° 49'.3 N	18° 24'.8	11° 18'.0 S
01	248° 54'.8	182° 50'.5	50'.6	202° 27'.0	20'.4	169° 00'.8	49'.3	33° 27'.4	18'.0
02	263° 57'.3	197° 49'.7	51'.2	217° 27'.6	21'.0	184° 02'.7	49'.4	48° 30'.1	17'.9
03	278° 59'.7	212° 48'.9	51'.7	232° 28'.3	21'.5	199° 04'.6	49'.4	63° 32'.7	17'.9
04	294° 02'.2	227° 48'.1	52'.3	247° 28'.9	22'.0	214° 06'.5	49'.4	78° 35'.3	17'.8
05	309° 04'.7	242° 47'.4	52'.9	262° 29'.5	22'.5	229° 08'.3	49'.5	93° 38'.0	17'.8
06	324° 07'.1	257° 46'.6	53'.5	277° 30'.2	23'.1	244° 10'.2	49'.5	108° 40'.6	17'.7
07	339° 09'.6	272° 45'.8	54'.1	292° 30'.8	23'.6	259° 12'.1	49'.6	123° 43'.2	17'.7
08	354° 12'.1	287° 45'.0	54'.7	307° 31'.5	24'.1	274° 13'.9	49'.6	138° 45'.9	17'.6
09	9° 14'.5	302° 44'.2	55'.3	322° 32'.1	24'.6	289° 15'.8	49'.7	153° 48'.5	17'.5
10	24° 17'.0	317° 43'.4	55'.9	337° 32'.7	25'.2	304° 17'.7	49'.7	168° 51'.1	17'.5
11	39° 19'.5	332° 42'.6	56'.5	352° 33'.4	25'.7	319° 19'.6	49'.7	183° 53'.8	17'.4
12	54° 21'.9	347° 41'.9	21° 57'.1 N	7° 34'.0	17° 26'.2 N	334° 21'.4	22° 49'.8 N	198° 56'.4	11° 17'.4 S
13	69° 24'.4	2° 41'.1	57'.6	22° 34'.6	26'.7	349° 23'.3	49'.8	213° 59'.0	17'.3
14	84° 26'.8	17° 40'.3	58'.2	37° 35'.3	27'.2	4° 25'.2	49'.9	229° 01'.7	17'.3
15	99° 29'.3	32° 39'.5	58'.8	52° 35'.9	27'.8	19° 27'.0	49'.9	244° 04'.3	17'.2
16	114° 31'.8	47° 38'.7	59'.4	67° 36'.6	28'.3	34° 28'.9	50'.0	259° 06'.9	17'.2
17	129° 34'.2	62° 37'.9	22° 00'.0 N	82° 37'.2	28'.8	49° 30'.8	50'.0	274° 09'.6	17'.1
18	144° 36'.7	77° 37'.1	00'.5	97° 37'.8	29'.3	64° 32'.7	50'.0	289° 12'.2	17'.1
19	159° 39'.2	92° 36'.3	01'.1	112° 38'.5	29'.8	79° 34'.5	50'.1	304° 14'.8	17'.0
20	174° 41'.6	107° 35'.5	01'.7	127° 39'.1	30'.4	94° 36'.4	50'.1	319° 17'.5	17'.0
21	189° 44'.1	122° 34'.8	02'.3	142° 39'.7	30'.9	109° 38'.3	50'.2	334° 20'.1	16'.9
22	204° 46'.6	137° 34'.0	02'.8	157° 40'.4	31'.4	124° 40'.1	50'.2	349° 22'.7	16'.9
23	219° 49'.0	152° 33'.2	03'.4	172° 41'.0	31'.9	139° 42'.0	50'.3	4° 25'.4	16'.8
17 Friday 00	234° 51'.5	167° 32'.4	22° 04'.0 N	187° 41'.6	17° 32'.4 N	154° 43'.9	22° 50'.3 N	19° 28'.0	11° 16'.8 S
01	249° 54'.0	182° 31'.6	04'.6	202° 42'.3	33'.0	169° 45'.7	50'.3	34° 30'.6	16'.7
02	264° 56'.4	197° 30'.8	05'.1	217° 42'.9	33'.5	184° 47'.6	50'.4	49° 33'.3	16'.7
03	279° 58'.9	212° 30'.0	05'.7	232° 43'.5	34'.0	199° 49'.5	50'.4	64° 35'.9	16'.6
04	295° 01'.3	227° 29'.2	06'.3	247° 44'.2	34'.5	214° 51'.3	50'.5	79° 38'.5	16'.6
05	310° 03'.8	242° 28'.4	06'.8	262° 44'.8	35'.0	229° 53'.2	50'.5	94° 41'.2	16'.5
06	325° 06'.3	257° 27'.6	07'.4	277° 45'.4	35'.5	244° 55'.1	50'.5	109° 43'.8	16'.5
07	340° 08'.7	272° 26'.8	08'.0	292° 46'.1	36'.1	259° 57'.0	50'.6	124° 46'.4	16'.4
08	355° 11'.2	287° 26'.0	08'.5	307° 46'.7	36'.6	274° 58'.8	50'.6	139° 49'.1	16'.4
09	10° 13'.7	302° 25'.2	09'.1	322° 47'.4	37'.1	290° 00'.7	50'.7	154° 51'.7	16'.3
10	25° 16'.1	317° 24'.4	09'.7	337° 48'.0	37'.6	305° 02'.6	50'.7	169° 54'.3	16'.3
11	40° 18'.6	332° 23'.7	10'.2	352° 48'.6	38'.1	320° 04'.4	50'.8	184° 57'.0	16'.2
12	55° 21'.1	347° 22'.9	22° 10'.8 N	7° 49'.3	17° 38'.6 N	335° 06'.3	22° 50'.8 N	199° 59'.6	11° 16'.2 S
13	70° 23'.5	2° 22'.1	11'.3	22° 49'.9	39'.1	350° 08'.2	50'.8	215° 02'.2	16'.1
14	85° 26'.0	17° 21'.3	11'.9	37° 50'.5	39'.7	5° 10'.0	50'.9	230° 04'.8	16'.1
15	100° 28'.5	32° 20'.5	12'.5	52° 51'.2	40'.2	20° 11'.9	50'.9	245° 07'.5	16'.0
16	115° 30'.9	47° 19'.7	13'.0	67° 51'.8	40'.7	35° 13'.8	51'.0	260° 10'.1	16'.0
17	130° 33'.4	62° 18'.9	13'.6	82° 52'.4	41'.2	50° 15'.6	51'.0	275° 12'.7	15'.9
18	145° 35'.8	77° 18'.1	14'.1	97° 53'.1	41'.7	65° 17'.5	51'.0	290° 15'.4	15'.9
19	160° 38'.3	92° 17'.3	14'.7	112° 53'.7	42'.2	80° 19'.4	51'.1	305° 18'.0	15'.8
20	175° 40'.8	107° 16'.5	15'.2	127° 54'.3	42'.7	95° 21'.3	51'.1	320° 20'.6	15'.8
21	190° 43'.2	122° 15'.7	15'.8	142° 55'.0	43'.2	110° 23'.1	51'.2	335° 23'.3	15'.7
22	205° 45'.7	137° 14'.9	16'.3	157° 55'.6	43'.8	125° 25'.0	51'.2	350° 25'.9	15'.6
23	220° 48'.2	152° 14'.1	16'.9	172° 56'.2	44'.3	140° 26'.9	51'.3	5° 28'.5	15'.6
18 Saturday 00	235° 50'.6	167° 13'.3	22° 17'.4 N	187° 56'.9	17° 44'.8 N	155° 28'.7	22° 51'.3 N	20° 31'.2	11° 15'.5 S
01	250° 53'.1	182° 12'.5	18'.0	202° 57'.5	45'.3	170° 30'.6	51'.3	35° 33'.8	15'.5
02	265° 55'.6	197° 11'.7	18'.5	217° 58'.1	45'.8	185° 32'.5	51'.4	50° 36'.4	15'.4
03	280° 58'.0	212° 10'.9	19'.0	232° 58'.8	46'.3	200° 34'.3	51'.4	65° 39'.0	15'.4
04	296° 00'.5	227° 10'.1	19'.6	247° 59'.4	46'.8	215° 36'.2	51'.5	80° 41'.7	15'.3
05	311° 02'.9	242° 09'.3	20'.1	263° 00'.0	47'.3	230° 38'.1	51'.5	95° 44'.3	15'.3
06	326° 05'.4	257° 08'.5	20'.7	278° 00'.7	47'.8	245° 39'.9	51'.5	110° 46'.9	15'.2
07	341° 07'.9	272° 07'.6	21'.2	293° 01'.3	48'.3	260° 41'.8	51'.6	125° 49'.6	15'.2
08	356° 10'.3	287° 06'.8	21'.7	308° 01'.9	48'.8	275° 43'.7	51'.6	140° 52'.2	15'.1
09	11° 12'.8	302° 06'.0	22'.3	323° 02'.6	49'.4	290° 45'.5	51'.7	155° 54'.8	15'.1
10	26° 15'.3	317° 05'.2	22'.8	338° 03'.2	49'.9	305° 47'.4	51'.7	170° 57'.5	15'.0
11	41° 17'.7	332° 04'.4	23'.4	353° 03'.8	50'.4	320° 49'.3	51'.8	186° 00'.1	15'.0
12	56° 20'.2	347° 03'.6	22° 23'.9 N	8° 04'.5	17° 50'.9 N	335° 51'.1	22° 51'.8 N	201° 02'.7	11° 14'.9 S
13	71° 22'.7	2° 02'.8	24'.4	23° 05'.1	51'.4	350° 53'.0	51'.8	216° 05'.4	14'.9
14	86° 25'.1	17° 02'.0	24'.9	38° 05'.7	51'.9	5° 54'.9	51'.9	231° 08'.0	14'.8
15	101° 27'.6	32° 01'.2	25'.5	53° 06'.4	52'.4	20° 56'.7	51'.9	246° 10'.6	14'.8
16	116° 30'.1	47° 00'.4	26'.0	68° 07'.0	52'.9	35° 58'.6	52'.0	261° 13'.2	14'.7
17	131° 32'.5	61° 59'.6	26'.5	83° 07'.6	53'.4	51° 00'.5	52'.0	276° 15'.9	14'.7
18	146° 35'.0	76° 58'.8	27'.1	98° 08'.3	53'.9	66° 02'.3	52'.0	291° 18'.5	14'.6
19	161° 37'.4	91° 58'.0	27'.6	113° 08'.9	54'.4	81° 04'.2	52'.1	306° 21'.1	14'.6
20	176° 39'.9	106° 57'.2	28'.1	128° 09'.5	54'.9	96° 06'.1	52'.1	321° 23'.8	14'.5
21	191° 42'.4	121° 56'.4	28'.6	143° 10'.2	55'.4	111° 07'.9	52'.2	336° 26'.4	14'.5
22	206° 44'.8	136° 55'.5	29'.2	158° 10'.8	55'.9	126° 09'.8	52'.2	351° 29'.0	14'.4
23	221° 47'.3	151° 54'.7	29'.7	173° 11'.4	56'.4	141° 11'.7	52'.2	6° 31'.6	14'.4
	M.P. 08:15	v -0'.8	d 0'.6	v 0'.6	d 0'.5	v 1'.9	d 0'.0	v 2'.6	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.1 S
Achernar	335° 27'.4	57° 10'.0 S
Acrux	173° 08'.9	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.3 N
Alkaid	152° 58'.5	49° 14'.9 N
Alnair	27° 43'.9	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.2 N
Alpheratz	357° 43'.7	29° 09'.7 N
Altair	62° 08'.1	8° 54'.3 N
Ankaa	353° 16'.1	42° 13'.8 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.3	69° 02'.9 S
Avior	234° 18'.3	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.7	7° 24'.4 N
Canopus	263° 56'.6	52° 42'.5 S
Capella	280° 35'.0	46° 00'.6 N
Deneb	49° 31'.3	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.2	17° 54'.7 S
Dubhe	193° 51'.6	61° 40'.9 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.7	51° 29'.2 N
Enif	33° 47'.2	9° 56'.2 N
Fomalhaut	15° 24'.2	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.6 S
Gienah	175° 52'.1	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.4 S
Hamal	328° 01'.1	23° 31'.4 N
Kaus Aust.	83° 43'.6	34° 22'.5 S
Kochab	137° 18'.9	74° 06'.1 N
Markab	13° 38'.5	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.4 N
Menkent	148° 07'.2	36° 26'.3 S
Miaplacidus	221° 39'.8	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.3 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 19'.1	56° 41'.1 S
Polaris	318° 14'.3	89° 19'.2 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.2	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.3	15° 44'.4 S
Schedar	349° 40'.9	56° 36'.4 N
Shaula	96° 21'.6	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.6	43° 29'.6 S
Vega	80° 38'.7	38° 47'.7 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	292° 40'.9	12:51
Mars	312° 50'.1	11:29
Jupiter	279° 52'.4	13:39
Saturn	144° 36'.5	22:38

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 54'.9	19° 05'.1 N	112° 06'.8	13'.4	15° 02'.4 N	7'.1	54'.4
195° 54'.9	05'.7	126° 39'.2	13'.5	14° 55'.3 N	7'.1	54'.5
210° 54'.9	06'.3	141° 11'.7	13'.4	48'.2	7'.2	
225° 54'.9	06'.9	155° 44'.1	13'.5	41'.0	7'.2	
240° 54'.9	07'.4	170° 16'.6	13'.5	33'.8	7'.4	
255° 54'.8	08'.0	184° 49'.1	13'.5	26'.4	7'.4	
270° 54'.8	08'.6	199° 21'.6	13'.6	19'.0	7'.4	
285° 54'.8	09'.1	213° 54'.2	13'.5	11'.6	7'.5	
300° 54'.8	09'.7	228° 26'.7	13'.6	04'.1	7'.6	54'.6
315° 54'.8	10'.3	242° 59'.3	13'.6	13° 56'.5 N	7'.7	
330° 54'.8	10'.9	257° 31'.9	13'.6	48'.8	7'.7	
345° 54'.8	11'.4	272° 04'.5	13'.6	41'.1	7'.8	
0° 54'.7	19° 12'.0 N	286° 37'.1	13'.6	13° 33'.3 N	7'.8	54'.6
15° 54'.7	12'.6	301° 09'.7	13'.7	25'.5	7'.9	
30° 54'.7	13'.2	315° 42'.4	13'.6	17'.6	8'.0	54'.7
45° 54'.7	13'.7	330° 15'.0	13'.7	09'.6	8'.0	
60° 54'.7	14'.3	344° 47'.7	13'.7	01'.6	8'.1	
75° 54'.7	14'.9	359° 20'.4	13'.7	12° 53'.5 N	8'.2	
90° 54'.6	15'.4	13° 53'.1	13'.7	45'.3	8'.2	
105° 54'.6	16'.0	28° 25'.8	13'.7	37'.1	8'.3	54'.8
120° 54'.6	16'.6	42° 58'.5	13'.8	28'.8	8'.3	
135° 54'.6	17'.1	57° 31'.3	13'.7	20'.5	8'.4	
150° 54'.6	17'.7	72° 04'.0	13'.8	12'.1	8'.5	
165° 54'.6	18'.3	86° 36'.8	13'.8	03'.6	8'.5	
180° 54'.5	19° 18'.8 N	101° 09'.6	13'.7	11° 55'.1 N	8'.6	54'.9
195° 54'.5	19'.4	115° 42'.3	13'.8	46'.5	8'.6	
210° 54'.5	19'.9	130° 15'.1	13'.8	37'.9	8'.7	
225° 54'.5	20'.5	144° 47'.9	13'.8	29'.2	8'.7	
240° 54'.5	21'.1	159° 20'.7	13'.8	20'.5	8'.8	55'.0
255° 54'.4	21'.6	173° 53'.5	13'.8	11'.7	8'.9	
270° 54'.4	22'.2	188° 26'.3	13'.9	02'.8	8'.9	
285° 54'.4	22'.8	202° 59'.2	13'.8	10° 53'.9 N	9'.0	
300° 54'.4	23'.3	217° 32'.0	13'.8	44'.9	9'.0	
315° 54'.4	23'.9	232° 04'.8	13'.9	35'.9	9'.1	55'.1
330° 54'.3	24'.4	246° 37'.7	13'.8	26'.8	9'.1	
345° 54'.3	25'.0	261° 10'.5	13'.9	17'.7	9'.2	
0° 54'.3	19° 25'.5 N	275° 43'.4	13'.8	10° 08'.5 N	9'.2	55'.1
15° 54'.3	26'.1	290° 16'.2	13'.9	9° 59'.3 N	9'.3	55'.2
30° 54'.3	26'.7	304° 49'.1	13'.8	50'.0	9'.3	
45° 54'.2	27'.2	319° 21'.9	13'.9	40'.7	9'.4	
60° 54'.2	27'.8	333° 54'.8	13'.8	31'.3	9'.4	
75° 54'.2	28'.3	348° 27'.6	13'.9	21'.9	9'.5	55'.3
90° 54'.2	28'.9	3° 00'.5	13'.8	12'.4	9'.6	
105° 54'.2	29'.4	17° 33'.3	13'.9	02'.8	9'.5	
120° 54'.1	30'.0	32° 06'.2	13'.8	8° 53'.3 N	9'.7	
135° 54'.1	30'.5	46° 39'.0	13'.9	43'.6	9'.7	55'.4
150° 54'.1	31'.1	61° 11'.9	13'.8	33'.9	9'.7	
165° 54'.1	31'.6	75° 44'.7	13'.9	24'.2	9'.8	
180° 54'.0	19° 32'.2 N	90° 17'.6	13'.8	8° 14'.4 N	9'.8	55'.4
195° 54'.0	32'.7	104° 50'.4	13'.8	04'.6	9'.8	55'.5
210° 54'.0	33'.3	119° 23'.2	13'.8	7° 54'.8 N	9'.9	
225° 54'.0	33'.8	133° 56'.0	13'.9	44'.9	10'.0	
240° 53'.9	34'.4	148° 28'.9	13'.8	34'.9	10'.0	55'.6
255° 53'.9	34'.9	163° 01'.7	13'.8	24'.9	10'.0	
270° 53'.9	35'.5	177° 34'.5	13'.8	14'.9	10'.1	
285° 53'.9	36'.0	192° 07'.3	13'.7	04'.8	10'.1	
300° 53'.8	36'.6	206° 40'.0	13'.8	6° 54'.7 N	10'.2	55'.7
315° 53'.8	37'.1	221° 12'.8	13'.8	44'.5	10'.2	
330° 53'.8	37'.7	235° 45'.6	13'.7	34'.3	10'.2	
345° 53'.8	38'.2	250° 18'.3	13'.7	24'.1	10'.3	55'.8
0° 53'.7	19° 38'.7 N	264° 51'.0	13'.8	6° 13'.8 N	10'.4	55'.8
15° 53'.7	39'.3	279° 23'.8	13'.7	03'.4	10'.3	
30° 53'.7	39'.8	293° 56'.5	13'.7	5° 53'.1 N	10'.4	55'.9
45° 53'.7	40'.4	308° 29'.2	13'.6	42'.7	10'.5	
60° 53'.6	40'.9	323° 01'.8	13'.7	32'.2	10'.4	
75° 53'.6	41'.5	337° 34'.5	13'.6	21'.8	10'.6	56'.0
90° 53'.6	42'.0	352° 07'.1	13'.7	11'.2	10'.5	
105° 53'.5	42'.5	6° 39'.8	13'.6	00'.7	10'.6	
120° 53'.5	43'.1	21° 12'.4	13'.6	4° 50'.1 N	10'.6	56'.1
135° 53'.5	43'.6	35° 45'.0	13'.5	39'.5	10'.6	
150° 53'.5	44'.2	50° 17'.5	13'.6	28'.9	10'.7	
165° 53'.4	44'.7	64° 50'.1	13'.5	18'.2	10'.7	
SD 15'.8	d 0'.6	SD	14'.9	15'.0	15'.2	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18
N 72°	-	-	-	07:24	09:14	10:59
N 70°	-	-	-	07:53	09:31	11:09
68°	-	-	01:35	08:15	09:45	11:17
66°	-	-	02:14	08:32	09:57	11:23
64°	-	00:51	02:40	08:46	10:06	11:28
62°	-	01:42	03:01	08:58	10:14	11:33
60°	-	02:12	03:18	09:07	10:21	11:37
N 58°	00:46	02:35	03:31	09:16	10:27	11:40
56°	01:32	02:53	03:43	09:23	10:32	11:43
54°	02:00	03:08	03:54	09:30	10:37	11:46
52°	02:21	03:20	04:03	09:36	10:41	11:49
50°	02:38	03:32	04:11	09:42	10:45	11:51
45°	03:10	03:54	04:29	09:53	10:54	11:56
N 40°	03:34	04:12	04:43	10:03	11:01	12:00
35°	03:52	04:27	04:55	10:11	11:07	12:04
30°	04:08	04:39	05:05	10:18	11:12	12:07
20°	04:31	04:59	05:23	10:31	11:21	12:12
N 10°	04:50	05:16	05:39	10:42	11:29	12:17
0°	05:05	05:31	05:53	10:52	11:37	12:22
S 10°	05:19	05:45	06:07	11:02	11:44	12:26
20°	05:32	05:59	06:22	11:13	11:52	12:31
30°	05:45	06:14	06:39	11:25	12:01	12:36
35°	05:51	06:22	06:49	11:32	12:07	12:40
40°	05:58	06:31	07:00	11:40	12:12	12:43
45°	06:06	06:41	07:13	11:50	12:19	12:47
S 50°	06:14	06:54	07:30	12:01	12:27	12:52
52°	06:18	06:59	07:37	12:06	12:31	12:54
54°	06:21	07:05	07:45	12:12	12:35	12:57
56°	06:26	07:12	07:55	12:18	12:40	12:59
58°	06:30	07:19	08:06	12:25	12:45	13:02
S 60°	06:35	07:28	08:18	12:34	12:51	13:06
S 62°	06:41	07:37	08:32	12:43	12:57	13:10

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 16	Moonset 17	Moonset 18
N 72°	-	-	-	02:11	01:55	01:42
N 70°	-	-	-	01:40	01:35	01:31
68°	22:23	-	-	01:17	01:20	01:22
66°	21:42	-	-	00:59	01:08	01:14
64°	21:15	23:11	-	00:45	00:57	01:07
62°	20:54	22:15	-	00:32	00:48	01:02
60°	20:37	21:43	-	00:22	00:41	00:57
N 58°	20:23	21:20	23:15	00:13	00:34	00:52
56°	20:11	21:02	22:24	00:05	00:28	00:48
54°	20:00	20:47	21:55	-	00:23	00:45
52°	19:51	20:34	21:34	-	00:18	00:42
50°	19:42	20:22	21:16	-	00:13	00:39
45°	19:25	19:59	20:43	-	00:04	00:32
N 40°	19:10	19:41	20:20	23:56	-	00:27
35°	18:58	19:27	20:01	23:49	-	00:22
30°	18:48	19:14	19:46	23:42	-	00:18
20°	18:30	18:54	19:22	23:32	-	00:11
N 10°	18:14	18:37	19:03	23:22	-	00:04
0°	18:00	18:22	18:47	23:14	23:58	24:43
S 10°	17:46	18:08	18:34	23:05	23:52	24:40
20°	17:31	17:54	18:21	22:55	23:46	24:37
30°	17:13	17:39	18:08	22:44	23:38	24:34
35°	17:03	17:31	18:01	22:38	23:34	24:32
40°	16:52	17:21	17:54	22:31	23:29	24:29
45°	16:39	17:11	17:47	22:22	23:23	24:26
S 50°	16:23	16:59	17:38	22:12	23:17	24:23
52°	16:15	16:53	17:35	22:07	23:13	24:22
54°	16:07	16:47	17:31	22:02	23:10	24:20
56°	15:57	16:40	17:27	21:56	23:06	24:18
58°	15:47	16:33	17:22	21:49	23:02	24:16
S 60°	15:34	16:24	17:17	21:42	22:57	24:14
S 62°	15:20	16:15	17:11	21:33	22:51	24:11

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
16	3 40	3 39	11:56	17:03	04:40	6d 34%
17	3 38	3 37	11:56	17:48	05:25	7d 43%
18	3 36	3 35	11:56	18:33	06:10	8d 53%

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2013 May 19, 20, 21 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.3		JUPITER -1.9		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
19 Sunday 00	236° 49'.8	166° 53'.9	22° 30'.2 N	188° 12'.1	17° 56'.9 N	156° 13'.5	22° 52'.3 N	21° 34'.3	11° 14'.3 S
01	251° 52'.2	181° 53'.1	30'.7	203° 12'.7	57'.4	171° 15'.4	52'.3	36° 36'.9	14'.3
02	266° 54'.7	196° 52'.3	31'.2	218° 13'.3	57'.9	186° 17'.3	52'.4	51° 39'.5	14'.2
03	281° 57'.2	211° 51'.5	31'.8	233° 14'.0	58'.4	201° 19'.1	52'.4	66° 42'.2	14'.2
04	296° 59'.6	226° 50'.7	32'.3	248° 14'.6	58'.9	216° 21'.0	52'.4	81° 44'.8	14'.1
05	312° 02'.1	241° 49'.9	32'.8	263° 15'.2	59'.4	231° 22'.9	52'.5	96° 47'.4	14'.1
06	327° 04'.6	256° 49'.1	33'.3	278° 15'.8	59'.9	246° 24'.7	52'.5	111° 50'.0	14'.0
07	342° 07'.0	271° 48'.2	33'.8	293° 16'.5	18° 00'.4 N	261° 26'.6	52'.6	126° 52'.7	14'.0
08	357° 09'.5	286° 47'.4	34'.3	308° 17'.1	00'.9	276° 28'.5	52'.6	141° 55'.3	13'.9
09	12° 11'.9	301° 46'.6	34'.8	323° 17'.7	01'.4	291° 30'.3	52'.6	156° 57'.9	13'.9
10	27° 14'.4	316° 45'.8	35'.3	338° 18'.4	01'.9	306° 32'.2	52'.7	172° 00'.6	13'.8
11	42° 16'.9	331° 45'.0	35'.8	353° 19'.0	02'.4	321° 34'.1	52'.7	187° 03'.2	13'.8
12	57° 19'.3	346° 44'.2	22° 36'.4 N	8° 19'.6	18° 02'.9 N	336° 35'.9	22° 52'.8 N	202° 05'.8	11° 13'.7 S
13	72° 21'.8	1° 43'.4	36'.9	23° 20'.3	03'.4	351° 37'.8	52'.8	217° 08'.4	13'.7
14	87° 24'.3	16° 42'.5	37'.4	38° 20'.9	03'.9	6° 39'.7	52'.8	232° 11'.1	13'.6
15	102° 26'.7	31° 41'.7	37'.9	53° 21'.5	04'.4	21° 41'.5	52'.9	247° 13'.7	13'.6
16	117° 29'.2	46° 40'.9	38'.4	68° 22'.2	04'.9	36° 43'.4	52'.9	262° 16'.3	13'.5
17	132° 31'.7	61° 40'.1	38'.9	83° 22'.8	05'.4	51° 45'.3	53'.0	277° 19'.0	13'.5
18	147° 34'.1	76° 39'.3	39'.4	98° 23'.4	05'.9	66° 47'.1	53'.0	292° 21'.6	13'.4
19	162° 36'.6	91° 38'.5	39'.9	113° 24'.0	06'.4	81° 49'.0	53'.0	307° 24'.2	13'.4
20	177° 39'.0	106° 37'.6	40'.4	128° 24'.7	06'.9	96° 50'.8	53'.1	322° 26'.8	13'.3
21	192° 41'.5	121° 36'.8	40'.9	143° 25'.3	07'.4	111° 52'.7	53'.1	337° 29'.5	13'.3
22	207° 44'.0	136° 36'.0	41'.4	158° 25'.9	07'.9	126° 54'.6	53'.2	352° 32'.1	13'.2
23	222° 46'.4	151° 35'.2	41'.9	173° 26'.6	08'.4	141° 56'.4	53'.2	7° 34'.7	13'.2
20 Monday 00	237° 48'.9	166° 34'.4	22° 42'.3 N	188° 27'.2	18° 08'.9 N	156° 58'.3	22° 53'.2 N	22° 37'.3	11° 13'.2 S
01	252° 51'.4	181° 33'.6	42'.8	203° 27'.8	09'.4	172° 00'.2	53'.3	37° 40'.0	13'.1
02	267° 53'.8	196° 32'.7	43'.3	218° 28'.5	09'.9	187° 02'.0	53'.3	52° 42'.6	13'.1
03	282° 56'.3	211° 31'.9	43'.8	233° 29'.1	10'.4	202° 03'.9	53'.4	67° 45'.2	13'.0
04	297° 58'.8	226° 31'.1	44'.3	248° 29'.7	10'.9	217° 05'.8	53'.4	82° 47'.9	13'.0
05	313° 01'.2	241° 30'.3	44'.8	263° 30'.3	11'.4	232° 07'.6	53'.4	97° 50'.5	12'.9
06	328° 03'.7	256° 29'.5	45'.3	278° 31'.0	11'.9	247° 09'.5	53'.5	112° 53'.1	12'.9
07	343° 06'.2	271° 28'.6	45'.8	293° 31'.6	12'.4	262° 11'.4	53'.5	127° 55'.7	12'.8
08	358° 08'.6	286° 27'.8	46'.3	308° 32'.2	12'.9	277° 13'.2	53'.6	142° 58'.4	12'.8
09	13° 11'.1	301° 27'.0	46'.7	323° 32'.9	13'.4	292° 15'.1	53'.6	158° 01'.0	12'.7
10	28° 13'.5	316° 26'.2	47'.2	338° 33'.5	13'.8	307° 16'.9	53'.6	173° 03'.6	12'.7
11	43° 16'.0	331° 25'.3	47'.7	353° 34'.1	14'.3	322° 18'.8	53'.7	188° 06'.2	12'.6
12	58° 18'.5	346° 24'.5	22° 48'.2 N	8° 34'.8	18° 14'.8 N	337° 20'.7	22° 53'.7 N	203° 08'.9	11° 12'.6 S
13	73° 20'.9	1° 23'.7	48'.7	23° 35'.4	15'.3	352° 22'.5	53'.8	218° 11'.5	12'.5
14	88° 23'.4	16° 22'.9	49'.1	38° 36'.0	15'.8	7° 24'.4	53'.8	233° 14'.1	12'.5
15	103° 25'.9	31° 22'.0	49'.6	53° 36'.6	16'.3	22° 26'.3	53'.8	248° 16'.7	12'.4
16	118° 28'.3	46° 21'.2	50'.1	68° 37'.3	16'.8	37° 28'.1	53'.9	263° 19'.4	12'.4
17	133° 30'.8	61° 20'.4	50'.6	83° 37'.9	17'.3	52° 30'.0	53'.9	278° 22'.0	12'.3
18	148° 33'.3	76° 19'.6	51'.0	98° 38'.5	17'.8	67° 31'.9	54'.0	293° 24'.6	12'.3
19	163° 35'.7	91° 18'.7	51'.5	113° 39'.2	18'.3	82° 33'.7	54'.0	308° 27'.2	12'.2
20	178° 38'.2	106° 17'.9	52'.0	128° 39'.8	18'.8	97° 35'.6	54'.0	323° 29'.9	12'.2
21	193° 40'.6	121° 17'.1	52'.5	143° 40'.4	19'.2	112° 37'.4	54'.1	338° 32'.5	12'.1
22	208° 43'.1	136° 16'.3	52'.9	158° 41'.0	19'.7	127° 39'.3	54'.1	353° 35'.1	12'.1
23	223° 45'.6	151° 15'.4	53'.4	173° 41'.7	20'.2	142° 41'.2	54'.2	8° 37'.8	12'.0
21 Tuesday 00	238° 48'.0	166° 14'.6	22° 53'.9 N	188° 42'.3	18° 20'.7 N	157° 43'.0	22° 54'.2 N	23° 40'.4	11° 12'.0 S
01	253° 50'.5	181° 13'.8	54'.3	203° 42'.9	21'.2	172° 44'.9	54'.2	38° 43'.0	11'.9
02	268° 53'.0	196° 13'.0	54'.8	218° 43'.6	21'.7	187° 46'.8	54'.3	53° 45'.6	11'.9
03	283° 55'.4	211° 12'.1	55'.2	233° 44'.2	22'.2	202° 48'.6	54'.3	68° 48'.3	11'.8
04	298° 57'.9	226° 11'.3	55'.7	248° 44'.8	22'.7	217° 50'.5	54'.3	83° 50'.9	11'.8
05	314° 00'.4	241° 10'.5	56'.2	263° 45'.4	23'.1	232° 52'.4	54'.4	98° 53'.5	11'.7
06	329° 02'.8	256° 09'.6	56'.6	278° 46'.1	23'.6	247° 54'.2	54'.4	113° 56'.1	11'.7
07	344° 05'.3	271° 08'.8	57'.1	293° 46'.7	24'.1	262° 56'.1	54'.5	128° 58'.7	11'.6
08	359° 07'.8	286° 08'.0	57'.5	308° 47'.3	24'.6	277° 57'.9	54'.5	144° 01'.4	11'.6
09	14° 10'.2	301° 07'.2	58'.0	323° 47'.9	25'.1	292° 59'.8	54'.5	159° 04'.0	11'.5
10	29° 12'.7	316° 06'.3	58'.5	338° 48'.6	25'.6	308° 01'.7	54'.6	174° 06'.6	11'.5
11	44° 15'.1	331° 05'.5	58'.9	353° 49'.2	26'.1	323° 03'.5	54'.6	189° 09'.2	11'.5
12	59° 17'.6	346° 04'.7	22° 59'.4 N	8° 49'.8	18° 26'.5 N	338° 05'.4	22° 54'.7 N	204° 11'.9	11° 11'.4 S
13	74° 20'.1	1° 03'.8	59'.8	23° 50'.5	27'.0	353° 07'.3	54'.7	219° 14'.5	11'.4
14	89° 22'.5	16° 03'.0	23° 00'.3 N	38° 51'.1	27'.5	8° 09'.1	54'.7	234° 17'.1	11'.3
15	104° 25'.0	31° 02'.2	00'.7	53° 51'.7	28'.0	23° 11'.0	54'.8	249° 19'.7	11'.3
16	119° 27'.5	46° 01'.3	01'.2	68° 52'.3	28'.5	38° 12'.8	54'.8	264° 22'.4	11'.2
17	134° 29'.9	61° 00'.5	01'.6	83° 53'.0	29'.0	53° 14'.7	54'.8	279° 25'.0	11'.2
18	149° 32'.4	75° 59'.7	02'.1	98° 53'.6	29'.4	68° 16'.6	54'.9	294° 27'.6	11'.1
19	164° 34'.9	90° 58'.8	02'.5	113° 54'.2	29'.9	83° 18'.4	54'.9	309° 30'.2	11'.1
20	179° 37'.3	105° 58'.0	02'.9	128° 54'.8	30'.4	98° 20'.3	55'.0	324° 32'.9	11'.0
21	194° 39'.8	120° 57'.2	03'.4	143° 55'.5	30'.9	113° 22'.1	55'.0	339° 35'.5	11'.0
22	209° 42'.3	135° 56'.3	03'.8	158° 56'.1	31'.4	128° 24'.0	55'.0	354° 38'.1	10'.9
23	224° 44'.7	150° 55'.5	04'.3	173° 56'.7	31'.8	143° 25'.9	55'.1	9° 40'.7	10'.9
	M.P. 08:03	v -0'.8	d 0'.5	v 0'.6	d 0'.5	v 1'.9	d 0'.0	v 2'.6	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.1 S
Achernar	335° 27'.4	57° 10'.0 S
Acrux	173° 08'.9	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.8 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.4 N
Alkaid	152° 58'.6	49° 14'.9 N
Alnair	27° 43'.8	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.2 N
Alpheratz	357° 43'.7	29° 09'.7 N
Altair	62° 08'.1	8° 54'.3 N
Ankaa	353° 16'.1	42° 13'.8 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.2	69° 02'.9 S
Avior	234° 18'.3	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.7	7° 24'.4 N
Canopus	263° 56'.6	52° 42'.5 S
Capella	280° 35'.0	46° 00'.5 N
Deneb	49° 31'.3	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.2	17° 54'.7 S
Dubhe	193° 51'.7	61° 40'.9 N
Elnath	278° 13'.0	28° 37'.0 N
Eltanin	90° 45'.7	51° 29'.2 N
Enif	33° 47'.1	9° 56'.2 N
Fomalhaut	15° 24'.1	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.4 S
Hamal	328° 01'.1	23° 31'.4 N
Kaus Aust.	83° 43'.6	34° 22'.5 S
Kochab	137° 19'.0	74° 06'.1 N
Markab	13° 38'.5	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 39'.8	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.3 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 19'.1	56° 41'.1 S
Polaris	318° 13'.9	89° 19'.1 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.2	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.3	15° 44'.4 S
Schedar	349° 40'.9	56° 36'.4 N
Shaula	96° 21'.6	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.6	43° 29'.6 S
Vega	80° 38'.7	38° 47'.7 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	288° 45'.5	12:54
Mars	310° 38'.3	11:26
Jupiter	279° 09'.4	13:30
Saturn	144° 48'.4	22:26

	SUN		MOON				
	GHA	Dec	GHA	v	Dec	d	HP
19	180° 53'.4	19° 45'.2 N	79° 22'.6	13'.5	4° 07'.5 N	10'.8	56'.2
20	195° 53'.4	45'.8	93° 55'.1	13'.5	3° 56'.7 N	10'.8	
21	210° 53'.3	46'.3	108° 27'.6	13'.4	45'.9	10'.8	
22	225° 53'.3	46'.8	123° 00'.0	13'.4	35'.1	10'.8	56'.3
23	240° 53'.3	47'.4	137° 32'.4	13'.4	24'.3	10'.9	
24	255° 53'.3	47'.9	152° 04'.8	13'.4	13'.4	10'.9	56'.4
25	270° 53'.2	48'.4	166° 37'.2	13'.4	02'.5	10'.9	
26	285° 53'.2	49'.0	181° 09'.6	13'.3	2° 51'.6 N	11'.0	
27	300° 53'.2	49'.5	195° 41'.9	13'.3	40'.6	10'.9	56'.5
28	315° 53'.1	50'.0	210° 14'.2	13'.2	29'.7	11'.0	
29	330° 53'.1	50'.6	224° 46'.4	13'.3	18'.7	11'.1	
30	345° 53'.1	51'.1	239° 18'.7	13'.1	07'.6	11'.0	56'.6
31	0° 53'.0	19° 51'.6 N	253° 50'.8	13'.2	1° 56'.6 N	11'.1	56'.6
32	15° 53'.0	52'.1	268° 23'.0	13'.1	45'.5	11'.1	
33	30° 53'.0	52'.7	282° 55'.1	13'.1	34'.4	11'.1	56'.7
34	45° 52'.9	53'.2	297° 27'.2	13'.1	23'.3	11'.2	
35	60° 52'.9	53'.7	311° 59'.3	13'.0	12'.1	11'.1	
36	75° 52'.9	54'.3	326° 31'.3	13'.0	01'.0	11'.2	56'.8
37	90° 52'.8	54'.8	341° 03'.3	12'.9	0° 49'.8 N	11'.2	
38	105° 52'.8	55'.3	355° 35'.2	12'.9	38'.6	11'.2	56'.9
39	120° 52'.8	55'.8	10° 07'.1	12'.9	27'.4	11'.3	
40	135° 52'.7	56'.4	24° 39'.0	12'.8	16'.1	11'.2	
41	150° 52'.7	56'.9	39° 10'.8	12'.8	04'.9	11'.3	57'.0
42	165° 52'.7	57'.4	53° 42'.6	12'.8	0° 06'.4 S	11'.3	
43	180° 52'.6	19° 57'.9 N	68° 14'.4	12'.7	0° 17'.7 S	11'.3	57'.0
44	195° 52'.6	58'.4	82° 46'.1	12'.6	29'.0	11'.3	57'.1
45	210° 52'.6	59'.0	97° 17'.7	12'.6	40'.3	11'.3	
46	225° 52'.5	59'.5	111° 49'.3	12'.6	51'.6	11'.3	57'.2
47	240° 52'.5	20° 00'.0 N	126° 20'.9	12'.5	1° 02'.9 S	11'.4	
48	255° 52'.5	00'.5	140° 52'.4	12'.5	14'.3	11'.3	
49	270° 52'.4	01'.0	155° 23'.9	12'.4	25'.6	11'.4	57'.3
50	285° 52'.4	01'.6	169° 55'.3	12'.4	37'.0	11'.4	
51	300° 52'.4	02'.1	184° 26'.7	12'.3	48'.4	11'.4	
52	315° 52'.3	02'.6	198° 58'.0	12'.3	59'.8	11'.3	57'.4
53	330° 52'.3	03'.1	213° 29'.3	12'.2	2° 11'.1 S	11'.4	
54	345° 52'.2	03'.6	228° 00'.5	12'.1	22'.5	11'.4	57'.5
55	0° 52'.2	20° 04'.1 N	242° 31'.6	12'.2	2° 33'.9 S	11'.4	57'.5
56	15° 52'.2	04'.7	257° 02'.8	12'.0	45'.3	11'.4	
57	30° 52'.1	05'.2	271° 33'.8	12'.0	56'.7	11'.4	57'.6
58	45° 52'.1	05'.7	286° 04'.8	12'.0	3° 08'.1 S	11'.4	
59	60° 52'.1	06'.2	300° 35'.8	11'.8	19'.5	11'.4	57'.7
60	75° 52'.0	06'.7	315° 06'.6	11'.9	30'.9	11'.5	
61	90° 52'.0	07'.2	329° 37'.5	11'.7	42'.4	11'.4	
62	105° 51'.9	07'.7	344° 08'.2	11'.8	53'.8	11'.3	57'.8
63	120° 51'.9	08'.2	358° 39'.0	11'.6	4° 05'.1 S	11'.4	
64	135° 51'.9	08'.8	13° 09'.6	11'.6	16'.5	11'.4	57'.9
65	150° 51'.8	09'.3	27° 40'.2	11'.5	27'.9	11'.4	
66	165° 51'.8	09'.8	42° 10'.7	11'.5	39'.3	11'.4	
67	180° 51'.7	20° 10'.3 N	56° 41'.2	11'.4	4° 50'.7 S	11'.3	58'.0
68	195° 51'.7	10'.8	71° 11'.6	11'.3	5° 02'.0 S	11'.4	
69	210° 51'.7	11'.3	85° 41'.9	11'.3	13'.4	11'.3	58'.1
70	225° 51'.6	11'.8	100° 12'.2	11'.2	24'.7	11'.4	
71	240° 51'.6	12'.3	114° 42'.4	11'.1	36'.1	11'.3	
72	255° 51'.5	12'.8	129° 12'.5	11'.1	47'.4	11'.3	58'.2
73	270° 51'.5	13'.3	143° 42'.6	11'.0	58'.7	11'.3	
74	285° 51'.5	13'.8	158° 12'.6	10'.9	6° 10'.0 S	11'.3	58'.3
75	300° 51'.4	14'.3	172° 42'.5	10'.9	21'.3	11'.2	
76	315° 51'.4	14'.8	187° 12'.4	10'.7	32'.5	11'.3	
77	330° 51'.3	15'.3	201° 42'.1	10'.8	43'.8	11'.2	58'.4
78	345° 51'.3	15'.8	216° 11'.9	10'.6	55'.0	11'.2	
79	0° 51'.2	20° 16'.3 N	230° 41'.5	10'.6	7° 06'.2 S	11'.1	58'.4
80	15° 51'.2	16'.8	245° 11'.1	10'.5	17'.3	11'.2	58'.5
81	30° 51'.2	17'.3	259° 40'.6	10'.4	28'.5	11'.1	
82	45° 51'.1	17'.8	274° 10'.0	10'.3	39'.6	11'.1	58'.6
83	60° 51'.1	18'.3	288° 39'.3	10'.3	50'.7	11'.1	
84	75° 51'.0	18'.8	303° 08'.6	10'.2	8° 01'.8 S	11'.0	
85	90° 51'.0	19'.3	317° 37'.8	10'.1	12'.8	11'.0	58'.7
86	105° 50'.9	19'.8	332° 06'.9	10'.0	23'.8	11'.0	
87	120° 50'.9	20'.3	346° 35'.9	10'.0	34'.8	11'.0	58'.8
88	135° 50'.8	20'.8	1° 04'.9	9'.8	45'.8	10'.9	
89	150° 50'.8	21'.3	15° 33'.7	9'.8	56'.7	10'.8	
90	165° 50'.8	21'.8	30° 02'.5	9'.7	9° 07'.5 S	10'.9	58'.9
SD	15'.8	d 0'.5	SD	15'.4	15'.7	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21
N 72°	-	-	-	12:45	14:34	16:30
N 70°	-	-	-	12:48	14:30	16:17
68°	-	-	01:16	12:50	14:26	16:07
66°	-	-	02:02	12:51	14:23	15:59
64°	-	00:09	02:31	12:53	14:20	15:52
62°	-	01:28	02:53	12:54	14:18	15:46
60°	-	02:03	03:11	12:55	14:16	15:41
N 58°	00:07	02:27	03:26	12:56	14:14	15:36
56°	01:20	02:46	03:38	12:57	14:13	15:32
54°	01:51	03:02	03:49	12:57	14:11	15:28
52°	02:14	03:15	03:59	12:58	14:10	15:25
50°	02:32	03:27	04:08	12:59	14:09	15:22
45°	03:06	03:51	04:26	13:00	14:07	15:16
N 40°	03:31	04:09	04:40	13:01	14:05	15:10
35°	03:50	04:25	04:53	13:02	14:03	15:06
30°	04:05	04:37	05:04	13:03	14:01	15:02
20°	04:30	04:58	05:22	13:05	13:59	14:55
N 10°	04:49	05:16	05:38	13:06	13:56	14:49
0°	05:05	05:31	05:53	13:07	13:54	14:43
S 10°	05:20	05:45	06:08	13:08	13:52	14:38
20°	05:33	06:00	06:23	13:10	13:50	14:32
30°	05:46	06:15	06:41	13:11	13:47	14:25
35°	05:53	06:24	06:51	13:12	13:46	14:21
40°	06:00	06:33	07:03	13:13	13:44	14:17
45°	06:08	06:44	07:17	13:14	13:42	14:12
S 50°	06:17	06:57	07:33	13:16	13:40	14:06
52°	06:21	07:03	07:41	13:17	13:39	14:04
54°	06:25	07:09	07:50	13:17	13:38	14:01
56°	06:30	07:16	08:00	13:18	13:37	13:57
58°	06:35	07:24	08:11	13:19	13:36	13:54
S 60°	06:40	07:33	08:24	13:20	13:34	13:50
S 62°	06:46	07:43	08:40	13:21	13:32	13:45

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 19	Moonset 20	Moonset 21
N 72°	-	-	-	01:32	01:21	01:10
N 70°	-	-	-	01:27	01:22	01:17
68°	22:44	-	-	01:22	01:23	01:23
66°	21:55	-	-	01:19	01:23	01:28
64°	21:24	-	-	01:16	01:24	01:33
62°	21:02	22:29	-	01:13	01:24	01:36
60°	20:44	21:53	-	01:11	01:25	01:39
N 58°	20:29	21:28	-	01:09	01:25	01:42
56°	20:16	21:09	22:37	01:07	01:25	01:45
54°	20:05	20:52	22:04	01:05	01:26	01:47
52°	19:55	20:39	21:41	01:04	01:26	01:49
50°	19:46	20:27	21:22	01:03	01:26	01:51
45°	19:28	20:03	20:48	00:59	01:27	01:55
N 40°	19:13	19:44	20:23	00:57	01:27	01:59
35°	19:01	19:29	20:04	00:55	01:28	02:02
30°	18:50	19:16	19:48	00:53	01:28	02:05
20°	18:31	18:55	19:23	00:49	01:28	02:09
N 10°	18:15	18:37	19:04	00:46	01:29	02:13
0°	18:00	18:22	18:48	00:43	01:29	02:17
S 10°	17:45	18:08	18:33	00:40	01:30	02:21
20°	17:30	17:53	18:20	00:37	01:30	02:25
30°	17:12	17:38	18:07	00:34	01:31	02:30
35°	17:02	17:29	18:00	00:32	01:31	02:33
40°	16:50	17:19	17:52	00:29	01:31	02:36
45°	16:36	17:08	17:44	00:26	01:32	02:39
S 50°	16:19	16:55	17:35	00:23	01:32	02:43
52°	16:11	16:50	17:31	00:22	01:32	02:45
54°	16:02	16:43	17:27	00:20	01:32	02:48
56°	15:53	16:36	17:23	00:18	01:33	02:50
58°	15:41	16:28	17:18	00:16	01:33	02:53
S 60°	15:28	16:19	17:12	00:14	01:33	02:56
S 62°	15:13	16:09	17:06	00:11	01:33	02:59

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
19	3 34	3 32	11:56	19:18	06:55	9d 63%
20	3 31	3 29	11:57	20:06	07:42	10d 73%
21	3 27	3 25	11:57	20:56	08:30	11d 82%

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2013 May 22, 23, 24 (Wed, Thur, Fri)

GMT	ARIES	VENUS -3.9		MARS +1.4		JUPITER -1.9		SATURN +0.2	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
22 Wednesday 00	239° 47'.2	165° 54'.7	23° 04'.7 N	188° 57'.4	18° 32'.3 N	158° 27'.7	22° 55'.1 N	24° 43'.4	11° 10'.8 S
01	254° 49'.6	180° 53'.8	05'.1	203° 58'.0	32'.8	173° 29'.6	55'.1	39° 46'.0	10'.8
02	269° 52'.1	195° 53'.0	05'.6	218° 58'.6	33'.3	188° 31'.5	55'.2	54° 48'.6	10'.7
03	284° 54'.6	210° 52'.2	06'.0	233° 59'.2	33'.8	203° 33'.3	55'.2	69° 51'.2	10'.7
04	299° 57'.0	225° 51'.3	06'.5	248° 59'.9	34'.2	218° 35'.2	55'.3	84° 53'.8	10'.6
05	314° 59'.5	240° 50'.5	06'.9	264° 00'.5	34'.7	233° 37'.0	55'.3	99° 56'.5	10'.6
06	330° 02'.0	255° 49'.6	07'.3	279° 01'.1	35'.2	248° 38'.9	55'.3	114° 59'.1	10'.5
07	345° 04'.4	270° 48'.8	07'.7	294° 01'.7	35'.7	263° 40'.8	55'.4	130° 01'.7	10'.5
08	0° 06'.9	285° 48'.0	08'.2	309° 02'.4	36'.2	278° 42'.6	55'.4	145° 04'.3	10'.5
09	15° 09'.4	300° 47'.1	08'.6	324° 03'.0	36'.6	293° 44'.5	55'.5	160° 07'.0	10'.4
10	30° 11'.8	315° 46'.3	09'.0	339° 03'.6	37'.1	308° 46'.3	55'.5	175° 09'.6	10'.4
11	45° 14'.3	330° 45'.5	09'.5	354° 04'.2	37'.6	323° 48'.2	55'.5	190° 12'.2	10'.3
12	60° 16'.7	345° 44'.6	23° 09'.9 N	9° 04'.9	18° 38'.1 N	338° 50'.1	22° 55'.6 N	205° 14'.8	11° 10'.3 S
13	75° 19'.2	0° 43'.8	10'.3	24° 05'.5	38'.5	353° 51'.9	55'.6	220° 17'.4	10'.2
14	90° 21'.7	15° 42'.9	10'.7	39° 06'.1	39'.0	8° 53'.8	55'.6	235° 20'.1	10'.2
15	105° 24'.1	30° 42'.1	11'.2	54° 06'.7	39'.5	23° 55'.6	55'.7	250° 22'.7	10'.1
16	120° 26'.6	45° 41'.3	11'.6	69° 07'.4	40'.0	38° 57'.5	55'.7	265° 25'.3	10'.1
17	135° 29'.1	60° 40'.4	12'.0	84° 08'.0	40'.4	53° 59'.4	55'.8	280° 27'.9	10'.0
18	150° 31'.5	75° 39'.6	12'.4	99° 08'.6	40'.9	69° 01'.2	55'.8	295° 30'.6	10'.0
19	165° 34'.0	90° 38'.7	12'.8	114° 09'.2	41'.4	84° 03'.1	55'.8	310° 33'.2	09'.9
20	180° 36'.5	105° 37'.9	13'.2	129° 09'.9	41'.9	99° 04'.9	55'.9	325° 35'.8	09'.9
21	195° 38'.9	120° 37'.1	13'.7	144° 10'.5	42'.3	114° 06'.8	55'.9	340° 38'.4	09'.8
22	210° 41'.4	135° 36'.2	14'.1	159° 11'.1	42'.8	129° 08'.7	55'.9	355° 41'.0	09'.8
23	225° 43'.9	150° 35'.4	14'.5	174° 11'.7	43'.3	144° 10'.5	56'.0	10° 43'.7	09'.7
23 Thursday 00	240° 46'.3	165° 34'.5	23° 14'.9 N	189° 12'.4	18° 43'.8 N	159° 12'.4	22° 56'.0 N	25° 46'.3	11° 09'.7 S
01	255° 48'.8	180° 33'.7	15'.3	204° 13'.0	44'.2	174° 14'.2	56'.1	40° 48'.9	09'.7
02	270° 51'.2	195° 32'.8	15'.7	219° 13'.6	44'.7	189° 16'.1	56'.1	55° 51'.5	09'.6
03	285° 53'.7	210° 32'.0	16'.1	234° 14'.2	45'.2	204° 18'.0	56'.1	70° 54'.1	09'.6
04	300° 56'.2	225° 31'.2	16'.5	249° 14'.9	45'.6	219° 19'.8	56'.2	85° 56'.8	09'.5
05	315° 58'.6	240° 30'.3	16'.9	264° 15'.5	46'.1	234° 21'.7	56'.2	100° 59'.4	09'.5
06	331° 01'.1	255° 29'.5	17'.3	279° 16'.1	46'.6	249° 23'.5	56'.2	116° 02'.0	09'.4
07	346° 03'.6	270° 28'.6	17'.7	294° 16'.7	47'.0	264° 25'.4	56'.3	131° 04'.6	09'.4
08	1° 06'.0	285° 27'.8	18'.1	309° 17'.4	47'.5	279° 27'.3	56'.3	146° 07'.2	09'.3
09	16° 08'.5	300° 26'.9	18'.6	324° 18'.0	48'.0	294° 29'.1	56'.3	161° 09'.9	09'.3
10	31° 11'.0	315° 26'.1	18'.9	339° 18'.6	48'.5	309° 31'.0	56'.4	176° 12'.5	09'.2
11	46° 13'.4	330° 25'.2	19'.3	354° 19'.2	48'.9	324° 32'.8	56'.4	191° 15'.1	09'.2
12	61° 15'.9	345° 24'.4	23° 19'.7 N	9° 19'.9	18° 49'.4 N	339° 34'.7	22° 56'.5 N	206° 17'.7	11° 09'.1 S
13	76° 18'.4	0° 23'.5	20'.1	24° 20'.5	49'.9	354° 36'.6	56'.5	221° 20'.4	09'.1
14	91° 20'.8	15° 22'.7	20'.5	39° 21'.1	50'.3	9° 38'.4	56'.5	236° 23'.0	09'.1
15	106° 23'.3	30° 21'.9	20'.9	54° 21'.7	50'.8	24° 40'.3	56'.6	251° 25'.6	09'.0
16	121° 25'.7	45° 21'.0	21'.3	69° 22'.3	51'.3	39° 42'.1	56'.6	266° 28'.2	09'.0
17	136° 28'.2	60° 20'.2	21'.7	84° 23'.0	51'.7	54° 44'.0	56'.6	281° 30'.8	08'.9
18	151° 30'.7	75° 19'.3	22'.1	99° 23'.6	52'.2	69° 45'.9	56'.7	296° 33'.4	08'.9
19	166° 33'.1	90° 18'.5	22'.5	114° 24'.2	52'.7	84° 47'.7	56'.7	311° 36'.1	08'.8
20	181° 35'.6	105° 17'.6	22'.9	129° 24'.8	53'.1	99° 49'.6	56'.7	326° 38'.7	08'.8
21	196° 38'.1	120° 16'.8	23'.3	144° 25'.5	53'.6	114° 51'.4	56'.8	341° 41'.3	08'.7
22	211° 40'.5	135° 15'.9	23'.7	159° 26'.1	54'.1	129° 53'.3	56'.8	356° 43'.9	08'.7
23	226° 43'.0	150° 15'.1	24'.0	174° 26'.7	54'.5	144° 55'.2	56'.9	11° 46'.5	08'.6
24 Friday 00	241° 45'.5	165° 14'.2	23° 24'.4 N	189° 27'.3	18° 55'.0 N	159° 57'.0	22° 56'.9 N	26° 49'.2	11° 08'.6 S
01	256° 47'.9	180° 13'.4	24'.8	204° 28'.0	55'.5	174° 58'.9	56'.9	41° 51'.8	08'.5
02	271° 50'.4	195° 12'.5	25'.2	219° 28'.6	55'.9	190° 00'.7	57'.0	56° 54'.4	08'.5
03	286° 52'.8	210° 11'.7	25'.6	234° 29'.2	56'.4	205° 02'.6	57'.0	71° 57'.0	08'.5
04	301° 55'.3	225° 10'.8	25'.9	249° 29'.8	56'.8	220° 04'.4	57'.0	86° 59'.6	08'.4
05	316° 57'.8	240° 10'.0	26'.3	264° 30'.4	57'.3	235° 06'.3	57'.1	102° 02'.3	08'.4
06	332° 00'.2	255° 09'.1	26'.7	279° 31'.1	57'.8	250° 08'.2	57'.1	117° 04'.9	08'.3
07	347° 02'.7	270° 08'.3	27'.1	294° 31'.7	58'.2	265° 10'.0	57'.1	132° 07'.5	08'.3
08	2° 05'.2	285° 07'.4	27'.4	309° 32'.3	58'.7	280° 11'.9	57'.2	147° 10'.1	08'.2
09	17° 07'.6	300° 06'.6	27'.8	324° 32'.9	59'.2	295° 13'.7	57'.2	162° 12'.7	08'.2
10	32° 10'.1	315° 05'.7	28'.2	339° 33'.6	59'.6	310° 15'.6	57'.3	177° 15'.3	08'.1
11	47° 12'.6	330° 04'.9	28'.6	354° 34'.2	19° 00'.1 N	325° 17'.5	57'.3	192° 18'.0	08'.1
12	62° 15'.0	345° 04'.0	23° 28'.9 N	9° 34'.8	19° 00'.5 N	340° 19'.3	22° 57'.3 N	207° 20'.6	11° 08'.0 S
13	77° 17'.5	0° 03'.2	29'.3	24° 35'.4	01'.0	355° 21'.2	57'.4	222° 23'.2	08'.0
14	92° 20'.0	15° 02'.3	29'.7	39° 36'.0	01'.5	10° 23'.0	57'.4	237° 25'.8	08'.0
15	107° 22'.4	30° 01'.4	30'.0	54° 36'.7	01'.9	25° 24'.9	57'.4	252° 28'.4	07'.9
16	122° 24'.9	45° 00'.6	30'.4	69° 37'.3	02'.4	40° 26'.7	57'.5	267° 31'.1	07'.9
17	137° 27'.3	59° 59'.7	30'.8	84° 37'.9	02'.8	55° 28'.6	57'.5	282° 33'.7	07'.8
18	152° 29'.8	74° 58'.9	31'.1	99° 38'.5	03'.3	70° 30'.5	57'.5	297° 36'.3	07'.8
19	167° 32'.3	89° 58'.0	31'.5	114° 39'.2	03'.8	85° 32'.3	57'.6	312° 38'.9	07'.7
20	182° 34'.7	104° 57'.2	31'.8	129° 39'.8	04'.2	100° 34'.2	57'.6	327° 41'.5	07'.7
21	197° 37'.2	119° 56'.3	32'.2	144° 40'.4	04'.7	115° 36'.0	57'.6	342° 44'.1	07'.6
22	212° 39'.7	134° 55'.5	32'.6	159° 41'.0	05'.1	130° 37'.9	57'.7	357° 46'.8	07'.6
23	227° 42'.1	149° 54'.6	32'.9	174° 41'.6	05'.6	145° 39'.7	57'.7	12° 49'.4	07'.5
	M.P. 07:52	v -0'.8	d 0'.4	v 0'.6	d 0'.5	v 1'.9	d 0'.0	v 2'.6	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.1 S
Achernar	335° 27'.3	57° 10'.0 S
Acrux	173° 08'.9	63° 10'.7 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.4 N
Alkaid	152° 58'.6	49° 14'.9 N
Alnair	27° 43'.8	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.2 N
Alpheratz	357° 43'.7	29° 09'.7 N
Altair	62° 08'.1	8° 54'.3 N
Ankaa	353° 16'.0	42° 13'.8 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.2	69° 02'.9 S
Avior	234° 18'.3	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.7	7° 24'.4 N
Canopus	263° 56'.6	52° 42'.5 S
Capella	280° 35'.0	46° 00'.5 N
Deneb	49° 31'.3	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.2	17° 54'.7 S
Dubhe	193° 51'.7	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.7	51° 29'.2 N
Enif	33° 47'.1	9° 56'.2 N
Fomalhaut	15° 24'.1	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.4 S
Hamal	328° 01'.1	23° 31'.4 N
Kaus Aust.	83° 43'.5	34° 22'.5 S
Kochab	137° 19'.0	74° 06'.2 N
Markab	13° 38'.4	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 39'.9	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.3 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 19'.1	56° 41'.1 S
Polaris	318° 13'.2	89° 19'.1 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.2	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.3	15° 44'.4 S
Schedar	349° 40'.9	56° 36'.4 N
Shaula	96° 21'.6	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.6	43° 29'.6 S
Vega	80° 38'.6	38° 47'.8 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	284° 48'.2	12:58
Mars	308° 26'.0	11:23
Jupiter	278° 26'.1	13:22
Saturn	145° 00'.0	22:13

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 50'.7	20° 22'.3 N	44° 31'.2	9'.7	9° 18'.4 S	10'.8	58'.9
195° 50'.7	22'.8	58° 59'.9	9'.5	29'.2	10'.8	59'.0
210° 50'.6	23'.3	73° 28'.4	9'.5	40'.0	10'.7	
225° 50'.6	23'.8	87° 56'.9	9'.3	50'.7	10'.7	
240° 50'.5	24'.3	102° 25'.2	9'.3	10° 01'.4 S	10'.6	59'.1
255° 50'.5	24'.8	116° 53'.5	9'.3	12'.0	10'.6	
270° 50'.4	25'.2	131° 21'.8	9'.1	22'.6	10'.5	59'.2
285° 50'.4	25'.7	145° 49'.9	9'.0	33'.1	10'.5	
300° 50'.3	26'.2	160° 17'.9	9'.0	43'.6	10'.5	
315° 50'.3	26'.7	174° 45'.9	8'.8	54'.1	10'.4	59'.3
330° 50'.2	27'.2	189° 13'.7	8'.8	11° 04'.5 S	10'.3	
345° 50'.2	27'.7	203° 41'.5	8'.7	14'.8	10'.3	
0° 50'.1	20° 28'.2 N	218° 09'.2	8'.6	11° 25'.1 S	10'.3	59'.4
15° 50'.1	28'.7	232° 36'.8	8'.5	35'.4	10'.1	
30° 50'.1	29'.1	247° 04'.3	8'.5	45'.5	10'.2	
45° 50'.0	29'.6	261° 31'.8	8'.3	55'.7	10'.0	59'.5
60° 50'.0	30'.1	275° 59'.1	8'.3	12° 05'.7 S	10'.0	
75° 49'.9	30'.6	290° 26'.4	8'.1	15'.7	10'.0	59'.6
90° 49'.9	31'.1	304° 53'.5	8'.1	25'.7	9'.9	
105° 49'.8	31'.6	319° 20'.6	8'.0	35'.6	9'.8	
120° 49'.8	32'.0	333° 47'.6	7'.9	45'.4	9'.7	59'.7
135° 49'.7	32'.5	348° 14'.5	7'.8	55'.1	9'.7	
150° 49'.7	33'.0	2° 41'.3	7'.7	13° 04'.8 S	9'.6	
165° 49'.6	33'.5	17° 08'.0	7'.6	14'.4	9'.6	59'.8
180° 49'.6	20° 34'.0 N	31° 34'.6	7'.6	13° 24'.0 S	9'.4	59'.8
195° 49'.5	34'.4	46° 01'.2	7'.4	33'.4	9'.4	
210° 49'.5	34'.9	60° 27'.6	7'.4	42'.8	9'.3	59'.9
225° 49'.4	35'.4	74° 54'.0	7'.2	52'.1	9'.3	
240° 49'.4	35'.9	89° 20'.2	7'.2	14° 01'.4 S	9'.1	
255° 49'.3	36'.3	103° 46'.4	7'.1	10'.5	9'.1	60'.0
270° 49'.2	36'.8	118° 12'.5	7'.0	19'.6	9'.0	
285° 49'.2	37'.3	132° 38'.5	6'.9	28'.6	8'.9	
300° 49'.1	37'.8	147° 04'.4	6'.8	37'.5	8'.8	60'.1
315° 49'.1	38'.2	161° 30'.2	6'.7	46'.3	8'.8	
330° 49'.0	38'.7	175° 55'.9	6'.7	55'.1	8'.6	
345° 49'.0	39'.2	190° 21'.6	6'.5	15° 03'.7 S	8'.6	60'.2
0° 48'.9	20° 39'.7 N	204° 47'.1	6'.5	15° 12'.3 S	8'.4	60'.2
15° 48'.9	40'.1	219° 12'.6	6'.3	20'.7	8'.4	
30° 48'.8	40'.6	233° 37'.9	6'.3	29'.1	8'.3	
45° 48'.8	41'.1	248° 03'.2	6'.2	37'.4	8'.2	60'.3
60° 48'.7	41'.5	262° 28'.4	6'.1	45'.6	8'.1	
75° 48'.7	42'.0	276° 53'.5	6'.0	53'.7	8'.0	
90° 48'.6	42'.5	291° 18'.5	6'.0	16° 01'.7 S	7'.8	60'.4
105° 48'.6	42'.9	305° 43'.5	5'.8	09'.5	7'.8	
120° 48'.5	43'.4	320° 08'.3	5'.8	17'.3	7'.7	
135° 48'.4	43'.9	334° 33'.1	5'.7	25'.0	7'.6	
150° 48'.4	44'.3	348° 57'.8	5'.5	32'.6	7'.5	60'.5
165° 48'.3	44'.8	3° 22'.3	5'.6	40'.1	7'.3	
180° 48'.3	20° 45'.3 N	17° 46'.9	5'.4	16° 47'.4 S	7'.3	60'.5
195° 48'.2	45'.7	32° 11'.3	5'.3	54'.7	7'.1	
210° 48'.2	46'.2	46° 35'.6	5'.3	17° 01'.8 S	7'.0	60'.6
225° 48'.1	46'.7	60° 59'.9	5'.2	08'.8	7'.0	
240° 48'.1	47'.1	75° 24'.1	5'.1	15'.8	6'.8	
255° 48'.0	47'.6	89° 48'.2	5'.0	22'.6	6'.6	
270° 47'.9	48'.0	104° 12'.2	5'.0	29'.2	6'.6	60'.7
285° 47'.9	48'.5	118° 36'.2	4'.9	35'.8	6'.4	
300° 47'.8	49'.0	133° 00'.1	4'.8	42'.2	6'.4	
315° 47'.8	49'.4	147° 23'.9	4'.7	48'.6	6'.2	
330° 47'.7	49'.9	161° 47'.6	4'.7	54'.8	6'.1	60'.8
345° 47'.6	50'.3	176° 11'.3	4'.5	18° 00'.9 S	5'.9	
0° 47'.6	20° 50'.8 N	190° 34'.8	4'.6	18° 06'.8 S	5'.8	60'.8
15° 47'.5	51'.2	204° 58'.4	4'.4	12'.6	5'.7	
30° 47'.5	51'.7	219° 21'.8	4'.4	18'.3	5'.6	
45° 47'.4	52'.2	233° 45'.2	4'.3	23'.9	5'.5	60'.9
60° 47'.4	52'.6	248° 08'.5	4'.2	29'.4	5'.3	
75° 47'.3	53'.1	262° 31'.7	4'.2	34'.7	5'.1	
90° 47'.2	53'.5	276° 54'.9	4'.2	39'.8	5'.1	
105° 47'.2	54'.0	291° 18'.1	4'.0	44'.9	4'.9	
120° 47'.1	54'.4	305° 41'.1	4'.0	49'.8	4'.8	
135° 47'.1	54'.9	320° 04'.1	4'.0	54'.6	4'.6	61'.0
150° 47'.0	55'.3	334° 27'.1	3'.9	59'.2	4'.5	
165° 46'.9	55'.8	348° 50'.0	3'.8	19° 03'.7 S	4'.4	
SD 15'.8	d 0'.5	SD 16'.2		16'.4	16'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 22	Moonrise 23	Moonrise 24
N 72°	-	-	-	18:37	21:08	-
N 70°	-	-	-	18:13	20:18	22:36
68°	-	-	00:53	17:54	19:46	21:38
66°	-	-	01:49	17:40	19:23	21:04
64°	-	-	02:22	17:27	19:05	20:39
62°	-	01:14	02:46	17:17	18:50	20:20
60°	-	01:53	03:05	17:09	18:38	20:04
N 58°	-	02:20	03:20	17:01	18:27	19:51
56°	01:07	02:40	03:34	16:54	18:18	19:39
54°	01:43	02:57	03:45	16:48	18:10	19:29
52°	02:08	03:11	03:55	16:43	18:02	19:20
50°	02:27	03:23	04:04	16:38	17:56	19:12
45°	03:02	03:48	04:23	16:28	17:42	18:55
N 40°	03:28	04:07	04:38	16:19	17:30	18:41
35°	03:48	04:23	04:51	16:12	17:20	18:29
30°	04:04	04:36	05:02	16:05	17:12	18:19
20°	04:29	04:57	05:21	15:54	16:57	18:01
N 10°	04:49	05:15	05:38	15:45	16:44	17:46
0°	05:05	05:31	05:53	15:36	16:32	17:32
S 10°	05:20	05:46	06:08	15:27	16:20	17:18
20°	05:34	06:01	06:24	15:17	16:08	17:03
30°	05:48	06:17	06:43	15:07	15:53	16:45
35°	05:55	06:26	06:53	15:01	15:45	16:35
40°	06:03	06:36	07:05	14:54	15:35	16:24
45°	06:11	06:47	07:20	14:46	15:25	16:11
S 50°	06:20	07:00	07:37	14:36	15:11	15:55
52°	06:24	07:07	07:45	14:32	15:05	15:47
54°	06:29	07:13	07:55	14:27	14:58	15:39
56°	06:34	07:21	08:05	14:21	14:51	15:29
58°	06:39	07:29	08:17	14:15	14:43	15:18
S 60°	06:45	07:38	08:30	14:09	14:33	15:06
S 62°	06:51	07:49	08:47	14:01	14:22	14:52

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 22	Moonset 23	Moonset 24
N 72°	-	-	-	00:58	00:41	00:09
N 70°	-	-	-	01:13	01:07	01:01
68°	23:10	-	-	01:25	01:27	01:33
66°	22:08	-	-	01:34	01:43	01:57
64°	21:34	-	-	01:43	01:56	02:16
62°	21:09	22:44	-	01:50	02:07	02:32
60°	20:50	22:03	-	01:56	02:17	02:45
N 58°	20:34	21:36	-	02:02	02:25	02:56
56°	20:21	21:15	22:51	02:07	02:33	03:06
54°	20:09	20:58	22:13	02:11	02:39	03:15
52°	19:59	20:44	21:48	02:15	02:45	03:22
50°	19:50	20:31	21:28	02:19	02:51	03:29
45°	19:31	20:07	20:52	02:27	03:02	03:44
N 40°	19:16	19:47	20:26	02:33	03:12	03:57
35°	19:03	19:31	20:06	02:39	03:20	04:07
30°	18:51	19:18	19:50	02:44	03:28	04:17
20°	18:32	18:56	19:25	02:53	03:40	04:33
N 10°	18:16	18:38	19:05	03:01	03:52	04:47
0°	18:00	18:22	18:48	03:08	04:02	05:00
S 10°	17:45	18:07	18:33	03:15	04:13	05:13
20°	17:29	17:52	18:19	03:23	04:24	05:27
30°	17:11	17:36	18:06	03:32	04:37	05:44
35°	17:00	17:27	17:58	03:37	04:44	05:53
40°	16:48	17:17	17:51	03:43	04:53	06:04
45°	16:33	17:06	17:42	03:50	05:03	06:16
S 50°	16:16	16:53	17:33	03:58	05:15	06:32
52°	16:08	16:46	17:29	04:02	05:20	06:39
54°	15:58	16:40	17:24	04:06	05:26	06:47
56°	15:48	16:32	17:19	04:11	05:33	06:56
58°	15:36	16:24	17:14	04:16	05:41	07:06
S 60°	15:23	16:15	17:08	04:22	05:50	07:18
S 62°	15:06	16:04	17:02	04:28	06:00	07:32

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
22	3 23	3 21	11:57	21:49	09:22	12d 90%
23	3 18	3 16	11:57	22:46	10:17	13d 96%
24	3 13	3 10	11:57	23:47	11:16	14d 99%

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2013 May 25, 26, 27 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.4		JUPITER -1.9		SATURN +0.3	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
25 Saturday 00	242° 44'.6	164° 53'.8	23° 33'.3 N	189° 42'.3	19° 06'.0 N	160° 41'.6	22° 57'.8 N	27° 52'.0	11° 07'.5 S
01	257° 47'.1	179° 52'.9	33'.6	204° 42'.9	06'.5	175° 43'.5	57'.8	42° 54'.6	07'.5
02	272° 49'.5	194° 52'.0	34'.0	219° 43'.5	07'.0	190° 45'.3	57'.8	57° 57'.2	07'.4
03	287° 52'.0	209° 51'.2	34'.3	234° 44'.1	07'.4	205° 47'.2	57'.9	72° 59'.8	07'.4
04	302° 54'.5	224° 50'.3	34'.7	249° 44'.7	07'.9	220° 49'.0	57'.9	88° 02'.5	07'.3
05	317° 56'.9	239° 49'.5	35'.0	264° 45'.4	08'.3	235° 50'.9	57'.9	103° 05'.1	07'.3
06	332° 59'.4	254° 48'.6	35'.4	279° 46'.0	08'.8	250° 52'.7	58'.0	118° 07'.7	07'.2
07	348° 01'.8	269° 47'.8	35'.7	294° 46'.6	09'.2	265° 54'.6	58'.0	133° 10'.3	07'.2
08	3° 04'.3	284° 46'.9	36'.1	309° 47'.2	09'.7	280° 56'.5	58'.0	148° 12'.9	07'.1
09	18° 06'.8	299° 46'.0	36'.4	324° 47'.8	10'.1	295° 58'.3	58'.1	163° 15'.5	07'.1
10	33° 09'.2	314° 45'.2	36'.8	339° 48'.5	10'.6	311° 00'.2	58'.1	178° 18'.1	07'.1
11	48° 11'.7	329° 44'.3	37'.1	354° 49'.1	11'.1	326° 02'.0	58'.1	193° 20'.8	07'.0
12	63° 14'.2	344° 43'.5	23° 37'.4 N	9° 49'.7	19° 11'.5 N	341° 03'.9	22° 58'.2 N	208° 23'.4	11° 07'.0 S
13	78° 16'.6	359° 42'.6	37'.8	24° 50'.3	12'.0	356° 05'.7	58'.2	223° 26'.0	06'.9
14	93° 19'.1	14° 41'.7	38'.1	39° 50'.9	12'.4	11° 07'.6	58'.2	238° 28'.6	06'.9
15	108° 21'.6	29° 40'.9	38'.5	54° 51'.6	12'.9	26° 09'.4	58'.3	253° 31'.2	06'.8
16	123° 24'.0	44° 40'.0	38'.8	69° 52'.2	13'.3	41° 11'.3	58'.3	268° 33'.8	06'.8
17	138° 26'.5	59° 39'.2	39'.1	84° 52'.8	13'.8	56° 13'.2	58'.3	283° 36'.5	06'.7
18	153° 29'.0	74° 38'.3	39'.5	99° 53'.4	14'.2	71° 15'.0	58'.4	298° 39'.1	06'.7
19	168° 31'.4	89° 37'.4	39'.8	114° 54'.0	14'.7	86° 16'.9	58'.4	313° 41'.7	06'.7
20	183° 33'.9	104° 36'.6	40'.1	129° 54'.7	15'.1	101° 18'.7	58'.5	328° 44'.3	06'.6
21	198° 36'.3	119° 35'.7	40'.5	144° 55'.3	15'.6	116° 20'.6	58'.5	343° 46'.9	06'.6
22	213° 38'.8	134° 34'.9	40'.8	159° 55'.9	16'.0	131° 22'.4	58'.5	358° 49'.5	06'.5
23	228° 41'.3	149° 34'.0	41'.1	174° 56'.5	16'.5	146° 24'.3	58'.6	13° 52'.1	06'.5
26 Sunday 00	243° 43'.7	164° 33'.1	23° 41'.4 N	189° 57'.1	19° 16'.9 N	161° 26'.2	22° 58'.6 N	28° 54'.8	11° 06'.4 S
01	258° 46'.2	179° 32'.3	41'.8	204° 57'.8	17'.4	176° 28'.0	58'.6	43° 57'.4	06'.4
02	273° 48'.7	194° 31'.4	42'.1	219° 58'.4	17'.8	191° 29'.9	58'.7	59° 00'.0	06'.4
03	288° 51'.1	209° 30'.5	42'.4	234° 59'.0	18'.3	206° 31'.7	58'.7	74° 02'.6	06'.3
04	303° 53'.6	224° 29'.7	42'.7	249° 59'.6	18'.7	221° 33'.6	58'.7	89° 05'.2	06'.3
05	318° 56'.1	239° 28'.8	43'.1	265° 00'.2	19'.2	236° 35'.4	58'.8	104° 07'.8	06'.2
06	333° 58'.5	254° 28'.0	43'.4	280° 00'.9	19'.6	251° 37'.3	58'.8	119° 10'.4	06'.2
07	349° 01'.0	269° 27'.1	43'.7	295° 01'.5	20'.1	266° 39'.1	58'.8	134° 13'.1	06'.1
08	4° 03'.5	284° 26'.2	44'.0	310° 02'.1	20'.5	281° 41'.0	58'.9	149° 15'.7	06'.1
09	19° 05'.9	299° 25'.4	44'.3	325° 02'.7	20'.9	296° 42'.9	58'.9	164° 18'.3	06'.0
10	34° 08'.4	314° 24'.5	44'.6	340° 03'.3	21'.4	311° 44'.7	58'.9	179° 20'.9	06'.0
11	49° 10'.8	329° 23'.6	45'.0	355° 03'.9	21'.8	326° 46'.6	59'.0	194° 23'.5	06'.0
12	64° 13'.3	344° 22'.8	23° 45'.3 N	10° 04'.6	19° 22'.3 N	341° 48'.4	22° 59'.0 N	209° 26'.1	11° 05'.9 S
13	79° 15'.8	359° 21'.9	45'.6	25° 05'.2	22'.7	356° 50'.3	59'.0	224° 28'.7	05'.9
14	94° 18'.2	14° 21'.0	45'.9	40° 05'.8	23'.2	11° 52'.1	59'.1	239° 31'.3	05'.8
15	109° 20'.7	29° 20'.2	46'.2	55° 06'.4	23'.6	26° 54'.0	59'.1	254° 34'.0	05'.8
16	124° 23'.2	44° 19'.3	46'.5	70° 07'.0	24'.1	41° 55'.8	59'.1	269° 36'.6	05'.7
17	139° 25'.6	59° 18'.4	46'.8	85° 07'.7	24'.5	56° 57'.7	59'.2	284° 39'.2	05'.7
18	154° 28'.1	74° 17'.6	47'.1	100° 08'.3	24'.9	71° 59'.5	59'.2	299° 41'.8	05'.7
19	169° 30'.6	89° 16'.7	47'.4	115° 08'.9	25'.4	87° 01'.4	59'.2	314° 44'.4	05'.6
20	184° 33'.0	104° 15'.8	47'.7	130° 09'.5	25'.8	102° 03'.3	59'.3	329° 47'.0	05'.6
21	199° 35'.5	119° 15'.0	48'.0	145° 10'.1	26'.3	117° 05'.1	59'.3	344° 49'.6	05'.5
22	214° 38'.0	134° 14'.1	48'.3	160° 10'.7	26'.7	132° 07'.0	59'.3	359° 52'.2	05'.5
23	229° 40'.4	149° 13'.2	48'.6	175° 11'.4	27'.2	147° 08'.8	59'.4	14° 54'.9	05'.4
27 Monday 00	244° 42'.9	164° 12'.4	23° 48'.9 N	190° 12'.0	19° 27'.6 N	162° 10'.7	22° 59'.4 N	29° 57'.5	11° 05'.4 S
01	259° 45'.3	179° 11'.5	49'.2	205° 12'.6	28'.0	177° 12'.5	59'.4	45° 00'.1	05'.4
02	274° 47'.8	194° 10'.6	49'.5	220° 13'.2	28'.5	192° 14'.4	59'.5	60° 02'.7	05'.3
03	289° 50'.3	209° 09'.8	49'.8	235° 13'.8	28'.9	207° 16'.2	59'.5	75° 05'.3	05'.3
04	304° 52'.7	224° 08'.9	50'.1	250° 14'.4	29'.4	222° 18'.1	59'.5	90° 07'.9	05'.2
05	319° 55'.2	239° 08'.0	50'.4	265° 15'.1	29'.8	237° 19'.9	59'.6	105° 10'.5	05'.2
06	334° 57'.7	254° 07'.2	50'.7	280° 15'.7	30'.2	252° 21'.8	59'.6	120° 13'.1	05'.1
07	350° 00'.1	269° 06'.3	51'.0	295° 16'.3	30'.7	267° 23'.7	59'.6	135° 15'.8	05'.1
08	5° 02'.6	284° 05'.4	51'.3	310° 16'.9	31'.1	282° 25'.5	59'.7	150° 18'.4	05'.1
09	20° 05'.1	299° 04'.6	51'.6	325° 17'.5	31'.5	297° 27'.4	59'.7	165° 21'.0	05'.0
10	35° 07'.5	314° 03'.7	51'.8	340° 18'.1	32'.0	312° 29'.2	59'.7	180° 23'.6	05'.0
11	50° 10'.0	329° 02'.8	52'.1	355° 18'.8	32'.4	327° 31'.1	59'.8	195° 26'.2	04'.9
12	65° 12'.4	344° 01'.9	23° 52'.4 N	10° 19'.4	19° 32'.9 N	342° 32'.9	22° 59'.8 N	210° 28'.8	11° 04'.9 S
13	80° 14'.9	359° 01'.1	52'.7	25° 20'.0	33'.3	357° 34'.8	59'.8	225° 31'.4	04'.8
14	95° 17'.4	14° 00'.2	53'.0	40° 20'.6	33'.7	12° 36'.6	59'.9	240° 34'.0	04'.8
15	110° 19'.8	28° 59'.3	53'.3	55° 21'.2	34'.2	27° 38'.5	59'.9	255° 36'.6	04'.8
16	125° 22'.3	43° 58'.5	53'.5	70° 21'.8	34'.6	42° 40'.3	59'.9	270° 39'.3	04'.7
17	140° 24'.8	58° 57'.6	53'.8	85° 22'.5	35'.0	57° 42'.2	23° 00'.0 N	285° 41'.9	04'.7
18	155° 27'.2	73° 56'.7	54'.1	100° 23'.1	35'.5	72° 44'.0	00'.0	300° 44'.5	04'.6
19	170° 29'.7	88° 55'.8	54'.4	115° 23'.7	35'.9	87° 45'.9	00'.0	315° 47'.1	04'.6
20	185° 32'.2	103° 55'.0	54'.6	130° 24'.3	36'.3	102° 47'.8	00'.1	330° 49'.7	04'.5
21	200° 34'.6	118° 54'.1	54'.9	145° 24'.9	36'.8	117° 49'.6	00'.1	345° 52'.3	04'.5
22	215° 37'.1	133° 53'.2	55'.2	160° 25'.5	37'.2	132° 51'.5	00'.1	0° 54'.9	04'.5
23	230° 39'.6	148° 52'.4	55'.5	175° 26'.2	37'.6	147° 53'.3	00'.2	15° 57'.5	04'.4
	M.P. 07:40	v -0'.9	d 0'.3	v 0'.6	d 0'.4	v 1'.9	d 0'.0	v 2'.6	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.1 S
Achernar	335° 27'.3	57° 10'.0 S
Acrux	173° 08'.9	63° 10'.7 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.4 N
Alkaid	152° 58'.6	49° 14'.9 N
Alnair	27° 43'.8	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.2 N
Alpheratz	357° 43'.7	29° 09'.7 N
Altair	62° 08'.1	8° 54'.3 N
Ankaa	353° 16'.0	42° 13'.8 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.2	69° 02'.9 S
Avior	234° 18'.3	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.7	7° 24'.4 N
Canopus	263° 56'.6	52° 42'.5 S
Capella	280° 35'.0	46° 00'.5 N
Deneb	49° 31'.3	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.1	17° 54'.7 S
Dubhe	193° 51'.7	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.7	51° 29'.2 N
Enif	33° 47'.1	9° 56'.2 N
Fomalhaut	15° 24'.1	29° 32'.8 S
Gacrux	172° 00'.6	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.4 S
Hamal	328° 01'.1	23° 31'.4 N
Kaus Aust.	83° 43'.5	34° 22'.5 S
Kochab	137° 19'.0	74° 06'.2 N
Markab	13° 38'.4	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.4 N
Menkent	148° 07'.2	36° 26'.3 S
Miaplacidus	221° 39'.9	69° 46'.8 S
Mirfak	308° 40'.9	49° 54'.3 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 19'.0	56° 41'.1 S
Polaris	318° 12'.3	89° 19'.1 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.2	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.8	56° 36'.4 N
Shaula	96° 21'.6	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.4 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.6	43° 29'.6 S
Vega	80° 38'.6	38° 47'.8 N
Zuben'ubi	137° 05'.1	16° 05'.9 S
	SHA	Mer.Pass.
Venus	280° 49'.4	13:03
Mars	306° 13'.4	11:20
Jupiter	277° 42'.4	13:13
Saturn	145° 11'.0	22:01

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 46'.9	20° 56'.2 N	3° 12'.8	3'.8	19° 08'.1 S	4'.2	61'.0
195° 46'.8	56'.7	17° 35'.6	3'.7	12'.3	4'.1	
210° 46'.7	57'.1	31° 58'.3	3'.7	16'.4	3'.9	
225° 46'.7	57'.6	46° 21'.0	3'.6	20'.3	3'.8	
240° 46'.6	58'.0	60° 43'.6	3'.6	24'.1	3'.7	61'.1
255° 46'.6	58'.5	75° 06'.2	3'.5	27'.8	3'.5	
270° 46'.5	58'.9	89° 28'.7	3'.5	31'.3	3'.4	
285° 46'.4	59'.3	103° 51'.2	3'.5	34'.7	3'.2	
300° 46'.4	59'.8	118° 13'.7	3'.4	37'.9	3'.1	
315° 46'.3	21° 00'.2 N	132° 36'.1	3'.4	41'.0	2'.9	
330° 46'.2	00'.7	146° 58'.5	3'.4	43'.9	2'.8	
345° 46'.2	01'.1	161° 20'.9	3'.3	46'.7	2'.6	
0° 46'.1	21° 01'.6 N	175° 43'.2	3'.3	19° 49'.3 S	2'.5	61'.1
15° 46'.1	02'.0	190° 05'.5	3'.2	51'.8	2'.3	
30° 46'.0	02'.4	204° 27'.7	3'.2	54'.1	2'.2	
45° 45'.9	02'.9	218° 49'.9	3'.2	56'.3	2'.1	61'.2
60° 45'.9	03'.3	233° 12'.1	3'.2	58'.4	1'.9	
75° 45'.8	03'.8	247° 34'.3	3'.2	20° 00'.3 S	1'.7	
90° 45'.7	04'.2	261° 56'.5	3'.1	02'.0	1'.6	
105° 45'.7	04'.6	276° 18'.6	3'.2	03'.6	1'.4	
120° 45'.6	05'.1	290° 40'.8	3'.1	05'.0	1'.3	
135° 45'.5	05'.5	305° 02'.9	3'.1	06'.3	1'.1	
150° 45'.5	05'.9	319° 25'.0	3'.0	07'.4	1'.0	
165° 45'.4	06'.4	333° 47'.0	3'.1	08'.4	0'.8	
180° 45'.3	21° 06'.8 N	348° 09'.1	3'.1	20° 09'.2 S	0'.6	61'.2
195° 45'.3	07'.2	2° 31'.2	3'.1	09'.8	0'.6	
210° 45'.2	07'.7	16° 53'.3	3'.0	10'.4	0'.3	
225° 45'.1	08'.1	31° 15'.3	3'.1	10'.7	0'.2	
240° 45'.1	08'.5	45° 37'.4	3'.1	10'.9	0'.1	
255° 45'.0	09'.0	59° 59'.5	3'.0	11'.0	0'.1	
270° 44'.9	09'.4	74° 21'.5	3'.1	10'.9	0'.3	
285° 44'.9	09'.8	88° 43'.6	3'.1	10'.6	0'.4	
300° 44'.8	10'.3	103° 05'.7	3'.1	10'.2	0'.6	
315° 44'.7	10'.7	117° 27'.8	3'.1	09'.6	0'.7	
330° 44'.7	11'.1	131° 49'.9	3'.1	08'.9	0'.9	
345° 44'.6	11'.5	146° 12'.0	3'.1	08'.0	1'.0	
0° 44'.5	21° 12'.0 N	160° 34'.1	3'.2	20° 07'.0 S	1'.2	61'.2
15° 44'.5	12'.4	174° 56'.3	3'.2	05'.8	1'.3	
30° 44'.4	12'.8	189° 18'.5	3'.2	04'.5	1'.5	61'.1
45° 44'.3	13'.2	203° 40'.7	3'.2	03'.0	1'.6	
60° 44'.3	13'.7	218° 02'.9	3'.2	01'.4	1'.8	
75° 44'.2	14'.1	232° 25'.1	3'.3	19° 59'.6 S	1'.9	
90° 44'.1	14'.5	246° 47'.4	3'.3	57'.7	2'.1	
105° 44'.0	14'.9	261° 09'.7	3'.4	55'.6	2'.2	
120° 44'.0	15'.4	275° 32'.1	3'.3	53'.4	2'.4	
135° 43'.9	15'.8	289° 54'.4	3'.4	51'.0	2'.5	
150° 43'.8	16'.2	304° 16'.8	3'.5	48'.5	2'.7	
165° 43'.8	16'.6	318° 39'.3	3'.5	45'.8	2'.8	
180° 43'.7	21° 17'.0 N	333° 01'.8	3'.5	19° 43'.0 S	3'.0	61'.1
195° 43'.6	17'.5	347° 24'.3	3'.6	40'.0	3'.1	61'.0
210° 43'.5	17'.9	1° 46'.9	3'.6	36'.9	3'.3	
225° 43'.5	18'.3	16° 09'.5	3'.7	33'.6	3'.4	
240° 43'.4	18'.7	30° 32'.2	3'.7	30'.2	3'.5	
255° 43'.3	19'.1	44° 54'.9	3'.7	26'.7	3'.7	
270° 43'.3	19'.5	59° 17'.6	3'.9	23'.0	3'.8	
285° 43'.2	20'.0	73° 40'.5	3'.8	19'.2	4'.0	
300° 43'.1	20'.4	88° 03'.3	4'.0	15'.2	4'.1	60'.9
315° 43'.0	20'.8	102° 26'.3	3'.9	11'.1	4'.2	
330° 43'.0	21'.2	116° 49'.2	4'.1	06'.9	4'.4	
345° 42'.9	21'.6	131° 12'.3	4'.1	02'.5	4'.5	
0° 42'.8	21° 22'.0 N	145° 35'.4	4'.1	18° 58'.0 S	4'.7	60'.9
15° 42'.7	22'.4	159° 58'.5	4'.3	53'.3	4'.8	
30° 42'.7	22'.8	174° 21'.8	4'.3	48'.5	4'.9	60'.8
45° 42'.6	23'.2	188° 45'.1	4'.3	43'.6	5'.1	
60° 42'.5	23'.7	203° 08'.4	4'.4	38'.5	5'.1	
75° 42'.4	24'.1	217° 31'.8	4'.5	33'.4	5'.4	
90° 42'.4	24'.5	231° 55'.3	4'.6	28'.0	5'.4	
105° 42'.3	24'.9	246° 18'.9	4'.6	22'.6	5'.6	60'.7
120° 42'.2	25'.3	260° 42'.5	4'.7	17'.0	5'.7	
135° 42'.1	25'.7	275° 06'.2	4'.8	11'.3	5'.8	
150° 42'.1	26'.1	289° 30'.0	4'.8	05'.5	5'.9	
165° 42'.0	26'.5	303° 53'.8	4'.9	17° 59'.6 S	6'.1	
SD 15'.8	d 0'.4	SD	16'.7	16'.7	16'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 25	Moonrise 26	Moonrise 27
N 72°	-	-	-	-	-	26:19
N 70°	-	-	-	-	-	25:01
68°	-	-	00:13	23:11	-	24:22
66°	-	-	01:37	22:28	23:24	23:55
64°	-	-	02:13	22:00	22:58	23:34
62°	-	00:58	02:39	21:38	22:37	23:17
60°	-	01:44	02:59	21:20	22:20	23:03
N 58°	-	02:13	03:15	21:05	22:06	22:51
56°	00:52	02:34	03:29	20:53	21:53	22:40
54°	01:34	02:52	03:41	20:41	21:43	22:31
52°	02:01	03:07	03:52	20:32	21:33	22:23
50°	02:22	03:19	04:01	20:23	21:24	22:15
45°	02:59	03:45	04:20	20:04	21:06	21:59
N 40°	03:25	04:05	04:36	19:49	20:52	21:46
35°	03:45	04:21	04:50	19:37	20:39	21:35
30°	04:02	04:34	05:01	19:25	20:28	21:25
20°	04:28	04:57	05:21	19:06	20:09	21:08
N 10°	04:48	05:15	05:38	18:50	19:53	20:53
0°	05:05	05:31	05:53	18:34	19:38	20:39
S 10°	05:21	05:47	06:09	18:19	19:22	20:26
20°	05:35	06:02	06:26	18:03	19:06	20:11
30°	05:49	06:19	06:44	17:44	18:47	19:54
35°	05:57	06:28	06:55	17:33	18:36	19:44
40°	06:05	06:38	07:08	17:20	18:24	19:32
45°	06:13	06:50	07:23	17:06	18:09	19:19
S 50°	06:23	07:04	07:41	16:48	17:51	19:03
52°	06:28	07:10	07:49	16:39	17:43	18:55
54°	06:32	07:17	07:59	16:30	17:33	18:47
56°	06:37	07:25	08:09	16:19	17:22	18:37
58°	06:43	07:33	08:22	16:07	17:10	18:26
S 60°	06:49	07:43	08:36	15:53	16:56	18:13
S 62°	06:56	07:54	08:53	15:36	16:39	17:59

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 25	Moonset 26	Moonset 27
N 72°	-	-	-	-	-	-
N 70°	-	-	-	00:49	-	02:31
68°	-	-	-	01:48	02:27	03:48
66°	22:21	-	-	02:23	03:10	04:26
64°	21:43	-	-	02:48	03:38	04:52
62°	21:17	23:02	-	03:08	04:00	05:12
60°	20:56	22:13	-	03:24	04:18	05:29
N 58°	20:40	21:43	-	03:37	04:33	05:43
56°	20:26	21:21	23:07	03:49	04:46	05:55
54°	20:14	21:03	22:22	04:00	04:57	06:06
52°	20:03	20:49	21:55	04:09	05:07	06:15
50°	19:54	20:36	21:34	04:17	05:15	06:24
45°	19:34	20:10	20:56	04:35	05:34	06:41
N 40°	19:18	19:50	20:30	04:49	05:49	06:56
35°	19:05	19:34	20:09	05:01	06:02	07:08
30°	18:53	19:20	19:52	05:12	06:13	07:19
20°	18:33	18:58	19:26	05:30	06:32	07:37
N 10°	18:16	18:39	19:06	05:46	06:49	07:53
0°	18:01	18:23	18:49	06:01	07:05	08:07
S 10°	17:45	18:07	18:33	06:16	07:20	08:22
20°	17:28	17:52	18:19	06:32	07:37	08:38
30°	17:09	17:35	18:05	06:51	07:56	08:56
35°	16:58	17:26	17:57	07:01	08:07	09:06
40°	16:46	17:16	17:49	07:14	08:19	09:18
45°	16:31	17:04	17:40	07:28	08:34	09:32
S 50°	16:13	16:50	17:30	07:46	08:52	09:49
52°	16:04	16:44	17:26	07:54	09:01	09:57
54°	15:55	16:37	17:21	08:03	09:11	10:05
56°	15:44	16:29	17:16	08:14	09:21	10:15
58°	15:32	16:20	17:11	08:26	09:34	10:27
S 60°	15:17	16:10	17:05	08:40	09:48	10:40
S 62°	15:00	15:59	16:58	08:56	10:05	10:55

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
25	3 08	3 05	11:57	24:49	12:18	15d Full
26	3 01	2 58	11:57	00:49	13:21	16d 97%
27	2 55	2 51	11:57	01:53	14:24	17d 92%

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2013 May 28, 29, 30 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.4		JUPITER -1.9		SATURN +0.3	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
28 Tuesday 00	245° 42'.0	163° 51'.5	23° 55'.7 N	190° 26'.8	19° 38'.1 N	162° 55'.2	23° 00'.2 N	31° 00'.1	11° 04'.4 S
01	260° 44'.5	178° 50'.6	56'.0	205° 27'.4	38'.5	177° 57'.0	00'.2	46° 02'.7	04'.3
02	275° 46'.9	193° 49'.7	56'.3	220° 28'.0	38'.9	192° 58'.9	00'.3	61° 05'.3	04'.3
03	290° 49'.4	208° 48'.9	56'.5	235° 28'.6	39'.4	208° 00'.7	00'.3	76° 08'.0	04'.3
04	305° 51'.9	223° 48'.0	56'.8	250° 29'.2	39'.8	223° 02'.6	00'.3	91° 10'.6	04'.2
05	320° 54'.3	238° 47'.1	57'.0	265° 29'.8	40'.2	238° 04'.4	00'.4	106° 13'.2	04'.2
06	335° 56'.8	253° 46'.2	57'.3	280° 30'.5	40'.7	253° 06'.3	00'.4	121° 15'.8	04'.1
07	350° 59'.3	268° 45'.4	57'.6	295° 31'.1	41'.1	268° 08'.1	00'.4	136° 18'.4	04'.1
08	6° 01'.7	283° 44'.5	57'.8	310° 31'.7	41'.5	283° 10'.0	00'.5	151° 21'.0	04'.0
09	21° 04'.2	298° 43'.6	58'.1	325° 32'.3	42'.0	298° 11'.8	00'.5	166° 23'.6	04'.0
10	36° 06'.7	313° 42'.8	58'.3	340° 32'.9	42'.4	313° 13'.7	00'.5	181° 26'.2	04'.0
11	51° 09'.1	328° 41'.9	58'.6	355° 33'.5	42'.8	328° 15'.5	00'.6	196° 28'.8	03'.9
12	66° 11'.6	343° 41'.0	23° 58'.9 N	10° 34'.2	19° 43'.2 N	343° 17'.4	23° 00'.6 N	211° 31'.4	11° 03'.9 S
13	81° 14'.1	358° 40'.1	59'.1	25° 34'.8	43'.7	358° 19'.3	00'.6	226° 34'.0	03'.8
14	96° 16'.5	13° 39'.3	59'.4	40° 35'.4	44'.1	13° 21'.1	00'.7	241° 36'.7	03'.8
15	111° 19'.0	28° 38'.4	59'.6	55° 36'.0	44'.5	28° 23'.0	00'.7	256° 39'.3	03'.8
16	126° 21'.4	43° 37'.5	59'.9	70° 36'.6	45'.0	43° 24'.8	00'.7	271° 41'.9	03'.7
17	141° 23'.9	58° 36'.6	24° 00'.1 N	85° 37'.2	45'.4	58° 26'.7	00'.7	286° 44'.5	03'.7
18	156° 26'.4	73° 35'.7	00'.4	100° 37'.8	45'.8	73° 28'.5	00'.8	301° 47'.1	03'.6
19	171° 28'.8	88° 34'.9	00'.6	115° 38'.5	46'.2	88° 30'.4	00'.8	316° 49'.7	03'.6
20	186° 31'.3	103° 34'.0	00'.8	130° 39'.1	46'.7	103° 32'.2	00'.8	331° 52'.3	03'.6
21	201° 33'.8	118° 33'.1	01'.1	145° 39'.7	47'.1	118° 34'.1	00'.9	346° 54'.9	03'.5
22	216° 36'.2	133° 32'.2	01'.3	160° 40'.3	47'.5	133° 35'.9	00'.9	1° 57'.5	03'.5
23	231° 38'.7	148° 31'.4	01'.6	175° 40'.9	47'.9	148° 37'.8	00'.9	17° 00'.1	03'.4
29 Wednesday 00	246° 41'.2	163° 30'.5	24° 01'.8 N	190° 41'.5	19° 48'.4 N	163° 39'.6	23° 01'.0 N	32° 02'.7	11° 03'.4 S
01	261° 43'.6	178° 29'.6	02'.1	205° 42'.1	48'.8	178° 41'.5	01'.0	47° 05'.3	03'.3
02	276° 46'.1	193° 28'.7	02'.3	220° 42'.7	49'.2	193° 43'.3	01'.0	62° 07'.9	03'.3
03	291° 48'.6	208° 27'.9	02'.5	235° 43'.4	49'.6	208° 45'.2	01'.1	77° 10'.5	03'.3
04	306° 51'.0	223° 27'.0	02'.8	250° 44'.0	50'.1	223° 47'.0	01'.1	92° 13'.2	03'.2
05	321° 53'.5	238° 26'.1	03'.0	265° 44'.6	50'.5	238° 48'.9	01'.1	107° 15'.8	03'.2
06	336° 55'.9	253° 25'.2	03'.2	280° 45'.2	50'.9	253° 50'.7	01'.2	122° 18'.4	03'.1
07	351° 58'.4	268° 24'.3	03'.5	295° 45'.8	51'.3	268° 52'.6	01'.2	137° 21'.0	03'.1
08	7° 00'.9	283° 23'.5	03'.7	310° 46'.4	51'.8	283° 54'.4	01'.2	152° 23'.6	03'.1
09	22° 03'.3	298° 22'.6	03'.9	325° 47'.0	52'.2	298° 56'.3	01'.3	167° 26'.2	03'.0
10	37° 05'.8	313° 21'.7	04'.1	340° 47'.7	52'.6	313° 58'.1	01'.3	182° 28'.8	03'.0
11	52° 08'.3	328° 20'.8	04'.4	355° 48'.3	53'.0	329° 00'.0	01'.3	197° 31'.4	02'.9
12	67° 10'.7	343° 20'.0	24° 04'.6 N	10° 48'.9	19° 53'.4 N	344° 01'.9	23° 01'.4 N	212° 34'.0	11° 02'.9 S
13	82° 13'.2	358° 19'.1	04'.8	25° 49'.5	53'.9	359° 03'.7	01'.4	227° 36'.6	02'.9
14	97° 15'.7	13° 18'.2	05'.0	40° 50'.1	54'.3	14° 05'.6	01'.4	242° 39'.2	02'.8
15	112° 18'.1	28° 17'.3	05'.3	55° 50'.7	54'.7	29° 07'.4	01'.4	257° 41'.8	02'.8
16	127° 20'.6	43° 16'.4	05'.5	70° 51'.3	55'.1	44° 09'.3	01'.5	272° 44'.4	02'.7
17	142° 23'.1	58° 15'.6	05'.7	85° 51'.9	55'.5	59° 11'.1	01'.5	287° 47'.0	02'.7
18	157° 25'.5	73° 14'.7	05'.9	100° 52'.6	56'.0	74° 13'.0	01'.5	302° 49'.6	02'.7
19	172° 28'.0	88° 13'.8	06'.1	115° 53'.2	56'.4	89° 14'.8	01'.6	317° 52'.2	02'.6
20	187° 30'.4	103° 12'.9	06'.4	130° 53'.8	56'.8	104° 16'.7	01'.6	332° 54'.8	02'.6
21	202° 32'.9	118° 12'.0	06'.6	145° 54'.4	57'.2	119° 18'.5	01'.6	347° 57'.5	02'.5
22	217° 35'.4	133° 11'.2	06'.8	160° 55'.0	57'.6	134° 20'.4	01'.7	3° 00'.1	02'.5
23	232° 37'.8	148° 10'.3	07'.0	175° 55'.6	58'.1	149° 22'.2	01'.7	18° 02'.7	02'.5
30 Thursday 00	247° 40'.3	163° 09'.4	24° 07'.2 N	190° 56'.2	19° 58'.5 N	164° 24'.1	23° 01'.7 N	33° 05'.3	11° 02'.4 S
01	262° 42'.8	178° 08'.5	07'.4	205° 56'.8	58'.9	179° 25'.9	01'.8	48° 07'.9	02'.4
02	277° 45'.2	193° 07'.6	07'.6	220° 57'.5	59'.3	194° 27'.8	01'.8	63° 10'.5	02'.3
03	292° 47'.7	208° 06'.7	07'.8	235° 58'.1	59'.7	209° 29'.6	01'.8	78° 13'.1	02'.3
04	307° 50'.2	223° 05'.9	08'.0	250° 58'.7	20° 00'.1 N	224° 31'.5	01'.8	93° 15'.7	02'.3
05	322° 52'.6	238° 05'.0	08'.2	265° 59'.3	00'.5	239° 33'.3	01'.9	108° 18'.3	02'.2
06	337° 55'.1	253° 04'.1	08'.4	280° 59'.9	01'.0	254° 35'.2	01'.9	123° 20'.9	02'.2
07	352° 57'.5	268° 03'.2	08'.6	296° 00'.5	01'.4	269° 37'.0	01'.9	138° 23'.5	02'.1
08	8° 00'.0	283° 02'.3	08'.8	311° 01'.1	01'.8	284° 38'.9	02'.0	153° 26'.1	02'.1
09	23° 02'.5	298° 01'.5	09'.0	326° 01'.7	02'.2	299° 40'.7	02'.0	168° 28'.7	02'.1
10	38° 04'.9	313° 00'.6	09'.2	341° 02'.3	02'.6	314° 42'.6	02'.0	183° 31'.3	02'.0
11	53° 07'.4	327° 59'.7	09'.4	356° 03'.0	03'.0	329° 44'.4	02'.1	198° 33'.9	02'.0
12	68° 09'.9	342° 58'.8	24° 09'.6 N	11° 03'.6	20° 03'.4 N	344° 46'.3	23° 02'.1 N	213° 36'.5	11° 01'.9 S
13	83° 12'.3	357° 57'.9	09'.8	26° 04'.2	03'.9	359° 48'.1	02'.1	228° 39'.1	01'.9
14	98° 14'.8	12° 57'.0	10'.0	41° 04'.8	04'.3	14° 50'.0	02'.1	243° 41'.7	01'.9
15	113° 17'.3	27° 56'.2	10'.2	56° 05'.4	04'.7	29° 51'.8	02'.2	258° 44'.3	01'.8
16	128° 19'.7	42° 55'.3	10'.4	71° 06'.0	05'.1	44° 53'.7	02'.2	273° 46'.9	01'.8
17	143° 22'.2	57° 54'.4	10'.6	86° 06'.6	05'.5	59° 55'.5	02'.2	288° 49'.5	01'.7
18	158° 24'.7	72° 53'.5	10'.8	101° 07'.2	05'.9	74° 57'.4	02'.3	303° 52'.1	01'.7
19	173° 27'.1	87° 52'.6	11'.0	116° 07'.8	06'.3	89° 59'.2	02'.3	318° 54'.7	01'.7
20	188° 29'.6	102° 51'.7	11'.2	131° 08'.5	06'.7	105° 01'.1	02'.3	333° 57'.3	01'.6
21	203° 32'.0	117° 50'.9	11'.3	146° 09'.1	07'.1	120° 02'.9	02'.4	348° 59'.9	01'.6
22	218° 34'.5	132° 50'.0	11'.5	161° 09'.7	07'.6	135° 04'.8	02'.4	4° 02'.5	01'.5
23	233° 37'.0	147° 49'.1	11'.7	176° 10'.3	08'.0	150° 06'.6	02'.4	19° 05'.1	01'.5
	M.P. 07:28	v -0'.9	d 0'.2	v 0'.6	d 0'.4	v 1'.9	d 0'.0	v 2'.6	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.8	40° 15'.1 S
Achernar	335° 27'.3	57° 09'.9 S
Acrux	173° 08'.9	63° 10'.7 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.4	55° 53'.4 N
Alkaid	152° 58'.6	49° 14'.9 N
Alnair	27° 43'.7	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.6	29° 09'.7 N
Altair	62° 08'.0	8° 54'.3 N
Ankaa	353° 16'.0	42° 13'.8 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.2	69° 02'.9 S
Avior	234° 18'.4	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.7	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.5 S
Capella	280° 35'.0	46° 00'.5 N
Deneb	49° 31'.2	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.1	17° 54'.7 S
Dubhe	193° 51'.7	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.3 N
Enif	33° 47'.1	9° 56'.2 N
Fomalhaut	15° 24'.1	29° 32'.8 S
Gacrux	172° 00'.6	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.4 S
Hamal	328° 01'.1	23° 31'.4 N
Kaus Aust.	83° 43'.5	34° 22'.5 S
Kochab	137° 19'.0	74° 06'.2 N
Markab	13° 38'.4	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.4 N
Menkent	148° 07'.2	36° 26'.3 S
Miaplacidus	221° 39'.9	69° 46'.8 S
Mirfak	308° 40'.8	49° 54'.3 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 19'.0	56° 41'.1 S
Polaris	318° 11'.5	89° 19'.1 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.8	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 52'.6	43° 29'.6 S
Vega	80° 38'.6	38° 47'.8 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	276° 49'.3	13:07
Mars	304° 00'.4	11:17
Jupiter	276° 58'.5	13:04
Saturn	145° 21'.6	21:48

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 41'.9	21° 26'.9 N	318° 17'.7	5'.0	17° 53'.5 S	6'.2	60'.6
195° 41'.8	27'.3	332° 41'.7	5'.1	47'.3	6'.3	
210° 41'.8	27'.7	347° 05'.8	5'.1	41'.0	6'.4	
225° 41'.7	28'.1	1° 29'.9	5'.3	34'.6	6'.6	
240° 41'.6	28'.5	15° 54'.2	5'.3	28'.0	6'.6	60'.5
255° 41'.5	28'.9	30° 18'.5	5'.3	21'.4	6'.8	
270° 41'.5	29'.3	44° 42'.8	5'.5	14'.6	6'.9	
285° 41'.4	29'.7	59° 07'.3	5'.6	07'.7	7'.0	
300° 41'.3	30'.1	73° 31'.9	5'.6	00'.7	7'.1	60'.4
315° 41'.2	30'.5	87° 56'.5	5'.7	16° 53'.6 S	7'.2	
330° 41'.1	30'.9	102° 21'.2	5'.8	46'.4	7'.3	
345° 41'.1	31'.3	116° 46'.0	5'.9	39'.1	7'.5	
0° 41'.0	21° 31'.7 N	131° 10'.9	5'.9	16° 31'.6 S	7'.5	60'.3
15° 40'.9	32'.1	145° 35'.8	6'.1	24'.1	7'.6	
30° 40'.8	32'.5	160° 00'.9	6'.1	16'.5	7'.8	
45° 40'.8	32'.9	174° 26'.0	6'.2	08'.7	7'.8	
60° 40'.7	33'.3	188° 51'.2	6'.3	00'.9	7'.9	60'.2
75° 40'.6	33'.7	203° 16'.5	6'.4	15° 53'.0 S	8'.1	
90° 40'.5	34'.1	217° 41'.9	6'.5	44'.9	8'.1	
105° 40'.4	34'.4	232° 07'.4	6'.5	36'.8	8'.2	60'.1
120° 40'.4	34'.8	246° 32'.9	6'.7	28'.6	8'.4	
135° 40'.3	35'.2	260° 58'.6	6'.7	20'.2	8'.4	
150° 40'.2	35'.6	275° 24'.3	6'.9	11'.8	8'.5	
165° 40'.1	36'.0	289° 50'.2	6'.9	03'.3	8'.6	60'.0
180° 40'.0	21° 36'.4 N	304° 16'.1	7'.0	14° 54'.7 S	8'.6	60'.0
195° 39'.9	36'.8	318° 42'.1	7'.1	46'.1	8'.8	
210° 39'.9	37'.2	333° 08'.2	7'.1	37'.3	8'.8	59'.9
225° 39'.8	37'.6	347° 34'.3	7'.3	28'.5	9'.0	
240° 39'.7	37'.9	2° 00'.6	7'.4	19'.5	9'.0	
255° 39'.6	38'.3	16° 27'.0	7'.4	10'.5	9'.1	59'.8
270° 39'.5	38'.7	30° 53'.4	7'.5	01'.4	9'.1	
285° 39'.5	39'.1	45° 19'.9	7'.6	13° 52'.3 S	9'.3	
300° 39'.4	39'.5	59° 46'.5	7'.7	43'.0	9'.3	59'.7
315° 39'.3	39'.9	74° 13'.2	7'.8	33'.7	9'.4	
330° 39'.2	40'.2	88° 40'.0	7'.9	24'.3	9'.5	
345° 39'.1	40'.6	103° 06'.9	8'.0	14'.8	9'.5	
0° 39'.0	21° 41'.0 N	117° 33'.9	8'.0	13° 05'.3 S	9'.6	59'.6
15° 39'.0	41'.4	132° 00'.9	8'.2	12° 55'.7 S	9'.7	
30° 38'.9	41'.8	146° 28'.1	8'.2	46'.0	9'.7	
45° 38'.8	42'.1	160° 55'.3	8'.3	36'.3	9'.8	59'.5
60° 38'.7	42'.5	175° 22'.6	8'.4	26'.5	9'.9	
75° 38'.6	42'.9	189° 50'.0	8'.5	16'.6	9'.9	
90° 38'.5	43'.3	204° 17'.5	8'.5	06'.7	10'.0	59'.4
105° 38'.5	43'.6	218° 45'.0	8'.7	11° 56'.7 S	10'.1	
120° 38'.4	44'.0	233° 12'.7	8'.7	46'.6	10'.1	
135° 38'.3	44'.4	247° 40'.4	8'.8	36'.5	10'.2	59'.3
150° 38'.2	44'.8	262° 08'.2	8'.9	26'.3	10'.2	
165° 38'.1	45'.1	276° 36'.1	9'.0	16'.1	10'.3	
180° 38'.0	21° 45'.5 N	291° 04'.1	9'.1	11° 05'.8 S	10'.3	59'.2
195° 37'.9	45'.9	305° 32'.2	9'.1	10° 55'.5 S	10'.4	
210° 37'.9	46'.3	320° 00'.3	9'.3	45'.1	10'.4	
225° 37'.8	46'.6	334° 28'.6	9'.3	34'.7	10'.5	59'.1
240° 37'.7	47'.0	348° 56'.9	9'.3	24'.2	10'.5	
255° 37'.6	47'.4	3° 25'.2	9'.5	13'.7	10'.6	59'.0
270° 37'.5	47'.7	17° 53'.7	9'.6	03'.1	10'.6	
285° 37'.4	48'.1	32° 22'.3	9'.6	9° 52'.5 S	10'.7	
300° 37'.3	48'.5	46° 50'.9	9'.7	41'.8	10'.7	58'.9
315° 37'.2	48'.8	61° 19'.6	9'.7	31'.1	10'.7	
330° 37'.2	49'.2	75° 48'.3	9'.9	20'.4	10'.8	
345° 37'.1	49'.6	90° 17'.2	9'.9	09'.6	10'.9	58'.8
0° 37'.0	21° 49'.9 N	104° 46'.1	10'.0	8° 58'.7 S	10'.8	58'.8
15° 36'.9	50'.3	119° 15'.1	10'.1	47'.9	10'.9	
30° 36'.8	50'.7	133° 44'.2	10'.1	37'.0	10'.9	58'.7
45° 36'.7	51'.0	148° 13'.3	10'.3	26'.1	11'.0	
60° 36'.6	51'.4	162° 42'.6	10'.3	15'.1	11'.0	
75° 36'.5	51'.7	177° 11'.9	10'.3	04'.1	11'.0	58'.6
90° 36'.4	52'.1	191° 41'.2	10'.5	7° 53'.1 S	11'.1	
105° 36'.4	52'.5	206° 10'.7	10'.5	42'.0	11'.1	
120° 36'.3	52'.8	220° 40'.2	10'.5	30'.9	11'.1	58'.5
135° 36'.2	53'.2	235° 09'.7	10'.7	19'.8	11'.1	
150° 36'.1	53'.5	249° 39'.4	10'.7	08'.7	11'.2	
165° 36'.0	53'.9	264° 09'.1	10'.7	6° 57'.5 S	11'.2	58'.4
SD 15'.8	d 0'.4	SD	16'.4	16'.2	16'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30
N 72°	-	-	-	02:19	01:25	01:06
N 70°	-	-	-	01:01	00:54	00:48
68°	-	-	-	00:22	00:30	00:34
66°	-	-	01:25	-	00:12	00:22
64°	-	-	02:05	23:57	-	00:12
62°	-	00:38	02:33	23:45	-	00:04
60°	-	01:35	02:54	23:34	23:56	24:14
N 58°	-	02:06	03:11	23:25	23:50	24:10
56°	00:34	02:29	03:25	23:16	23:44	24:07
54°	01:26	02:47	03:38	23:09	23:39	24:04
52°	01:55	03:03	03:49	23:02	23:34	24:01
50°	02:17	03:16	03:58	22:56	23:30	23:59
45°	02:56	03:42	04:18	22:44	23:21	23:53
N 40°	03:23	04:03	04:35	22:33	23:13	23:49
35°	03:44	04:19	04:48	22:24	23:07	23:45
30°	04:01	04:33	05:00	22:16	23:01	23:41
20°	04:27	04:56	05:20	22:02	22:51	23:35
N 10°	04:48	05:15	05:38	21:50	22:42	23:30
0°	05:06	05:32	05:54	21:38	22:33	23:25
S 10°	05:21	05:47	06:10	21:27	22:25	23:20
20°	05:36	06:03	06:27	21:14	22:16	23:14
30°	05:51	06:20	06:46	21:00	22:06	23:08
35°	05:58	06:30	06:57	20:52	22:00	23:05
40°	06:07	06:40	07:10	20:43	21:53	23:01
45°	06:16	06:52	07:25	20:32	21:45	22:56
S 50°	06:26	07:07	07:44	20:19	21:35	22:50
52°	06:31	07:13	07:53	20:13	21:31	22:48
54°	06:36	07:21	08:03	20:06	21:26	22:45
56°	06:41	07:29	08:14	19:58	21:21	22:42
58°	06:47	07:38	08:27	19:49	21:15	22:38
S 60°	06:53	07:48	08:42	19:40	21:08	22:34
S 62°	07:00	07:59	09:00	19:28	21:00	22:30

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 28	Moonset 29	Moonset 30
N 72°	-	-	-	03:41	06:35	08:47
N 70°	-	-	-	04:58	07:06	09:03
68°	-	-	-	05:36	07:28	09:16
66°	22:34	-	-	06:02	07:45	09:26
64°	21:52	-	-	06:22	07:59	09:35
62°	21:24	23:25	-	06:39	08:11	09:42
60°	21:02	22:23	-	06:52	08:21	09:49
N 58°	20:45	21:51	-	07:04	08:29	09:54
56°	20:30	21:27	23:28	07:14	08:37	09:59
54°	20:18	21:08	22:31	07:23	08:44	10:04
52°	20:07	20:53	22:01	07:31	08:50	10:08
50°	19:57	20:40	21:39	07:38	08:55	10:11
45°	19:37	20:13	21:00	07:53	09:07	10:19
N 40°	19:21	19:53	20:33	08:06	09:16	10:25
35°	19:07	19:36	20:12	08:16	09:25	10:31
30°	18:55	19:22	19:54	08:25	09:32	10:36
20°	18:35	18:59	19:28	08:41	09:44	10:44
N 10°	18:17	18:40	19:07	08:55	09:55	10:51
0°	18:01	18:23	18:49	09:08	10:05	10:58
S 10°	17:45	18:08	18:34	09:21	10:15	11:05
20°	17:28	17:52	18:19	09:34	10:25	11:12
30°	17:08	17:34	18:04	09:50	10:37	11:20
35°	16:57	17:25	17:56	09:58	10:44	11:25
40°	16:44	17:14	17:48	10:09	10:52	11:30
45°	16:29	17:02	17:39	10:20	11:01	11:36
S 50°	16:10	16:48	17:28	10:35	11:12	11:43
52°	16:02	16:41	17:24	10:41	11:17	11:46
54°	15:52	16:34	17:19	10:49	11:22	11:50
56°	15:41	16:26	17:14	10:57	11:29	11:54
58°	15:28	16:17	17:08	11:06	11:35	11:58
S 60°	15:13	16:07	17:01	11:16	11:43	12:03
S 62°	14:55	15:55	16:54	11:29	11:52	12:09

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
28	2 48	2 44	11:57	02:54	15:23	18d 84%
29	2 40	2 36	11:57	03:52	16:19	19d 75%
30	2 32	2 28	11:58	04:46	17:12	20d 64%

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2013 May 31, Jun. 1, 2 (Fri, Saint, Sun)

GMT		ARIES	VENUS -3.9		MARS +1.4		JUPITER -1.9		SATURN +0.3	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
31 Friday	00	248° 39'.4	162° 48'.2	24° 11'.9 N	191° 10'.9	20° 08'.4 N	165° 08'.5	23° 02'.5 N	34° 07'.7	11° 01'.5 S
	01	263° 41'.9	177° 47'.3	12'.1	206° 11'.5	08'.8	180° 10'.3	02'.5	49° 10'.3	01'.4
	02	278° 44'.4	192° 46'.4	12'.3	221° 12'.1	09'.2	195° 12'.2	02'.5	64° 12'.9	01'.4
	03	293° 46'.8	207° 45'.6	12'.4	236° 12'.7	09'.6	210° 14'.0	02'.5	79° 15'.5	01'.4
	04	308° 49'.3	222° 44'.7	12'.6	251° 13'.3	10'.0	225° 15'.9	02'.6	94° 18'.1	01'.3
	05	323° 51'.8	237° 43'.8	12'.8	266° 14'.0	10'.4	240° 17'.7	02'.6	109° 20'.7	01'.3
	06	338° 54'.2	252° 42'.9	13'.0	281° 14'.6	10'.8	255° 19'.6	02'.6	124° 23'.3	01'.2
	07	353° 56'.7	267° 42'.0	13'.1	296° 15'.2	11'.2	270° 21'.4	02'.7	139° 26'.0	01'.2
	08	8° 59'.2	282° 41'.1	13'.3	311° 15'.8	11'.6	285° 23'.3	02'.7	154° 28'.6	01'.2
	09	24° 01'.6	297° 40'.2	13'.5	326° 16'.4	12'.0	300° 25'.1	02'.7	169° 31'.2	01'.1
	10	39° 04'.1	312° 39'.4	13'.6	341° 17'.0	12'.4	315° 27'.0	02'.7	184° 33'.8	01'.1
	11	54° 06'.5	327° 38'.5	13'.8	356° 17'.6	12'.8	330° 28'.8	02'.8	199° 36'.4	01'.0
	12	69° 09'.0	342° 37'.6	24° 14'.0 N	11° 18'.2	20° 13'.2 N	345° 30'.7	23° 02'.8 N	214° 39'.0	11° 01'.0 S
	13	84° 11'.5	357° 36'.7	14'.1	26° 18'.8	13'.7	0° 32'.5	02'.8	229° 41'.6	01'.0
	14	99° 13'.9	12° 35'.8	14'.3	41° 19'.4	14'.1	15° 34'.4	02'.9	244° 44'.2	00'.9
	15	114° 16'.4	27° 34'.9	14'.5	56° 20'.1	14'.5	30° 36'.2	02'.9	259° 46'.8	00'.9
	16	129° 18'.9	42° 34'.0	14'.6	71° 20'.7	14'.9	45° 38'.1	02'.9	274° 49'.4	00'.9
	17	144° 21'.3	57° 33'.2	14'.8	86° 21'.3	15'.3	60° 39'.9	03'.0	289° 52'.0	00'.8
	18	159° 23'.8	72° 32'.3	14'.9	101° 21'.9	15'.7	75° 41'.8	03'.0	304° 54'.6	00'.8
	19	174° 26'.3	87° 31'.4	15'.1	116° 22'.5	16'.1	90° 43'.6	03'.0	319° 57'.2	00'.7
	20	189° 28'.7	102° 30'.5	15'.3	131° 23'.1	16'.5	105° 45'.5	03'.0	334° 59'.8	00'.7
	21	204° 31'.2	117° 29'.6	15'.4	146° 23'.7	16'.9	120° 47'.3	03'.1	350° 02'.4	00'.7
	22	219° 33'.6	132° 28'.7	15'.6	161° 24'.3	17'.3	135° 49'.2	03'.1	5° 05'.0	00'.6
	23	234° 36'.1	147° 27'.8	15'.7	176° 24'.9	17'.7	150° 51'.0	03'.1	20° 07'.6	00'.6
1 Saturday	00	249° 38'.6	162° 26'.9	24° 15'.9 N	191° 25'.5	20° 18'.1 N	165° 52'.9	23° 03'.2 N	35° 10'.2	11° 00'.5 S
	01	264° 41'.0	177° 26'.1	16'.0	206° 26'.1	18'.5	180° 54'.7	03'.2	50° 12'.8	00'.5
	02	279° 43'.5	192° 25'.2	16'.2	221° 26'.7	18'.9	195° 56'.5	03'.2	65° 15'.3	00'.5
	03	294° 46'.0	207° 24'.3	16'.3	236° 27'.4	19'.3	210° 58'.4	03'.2	80° 17'.9	00'.4
	04	309° 48'.4	222° 23'.4	16'.5	251° 28'.0	19'.7	226° 00'.2	03'.3	95° 20'.5	00'.4
	05	324° 50'.9	237° 22'.5	16'.6	266° 28'.6	20'.1	241° 02'.1	03'.3	110° 23'.1	00'.4
	06	339° 53'.4	252° 21'.6	16'.8	281° 29'.2	20'.5	256° 03'.9	03'.3	125° 25'.7	00'.3
	07	354° 55'.8	267° 20'.7	16'.9	296° 29'.8	20'.9	271° 05'.8	03'.4	140° 28'.3	00'.3
	08	9° 58'.3	282° 19'.8	17'.0	311° 30'.4	21'.3	286° 07'.6	03'.4	155° 30'.9	00'.2
	09	25° 00'.8	297° 19'.0	17'.2	326° 31'.0	21'.7	301° 09'.5	03'.4	170° 33'.5	00'.2
	10	40° 03'.2	312° 18'.1	17'.3	341° 31'.6	22'.1	316° 11'.3	03'.4	185° 36'.1	00'.2
	11	55° 05'.7	327° 17'.2	17'.5	356° 32'.2	22'.5	331° 13'.2	03'.5	200° 38'.7	00'.1
	12	70° 08'.1	342° 16'.3	24° 17'.6 N	11° 32'.8	20° 22'.9 N	346° 15'.0	23° 03'.5 N	215° 41'.3	11° 00'.1 S
	13	85° 10'.6	357° 15'.4	17'.7	26° 33'.4	23'.3	1° 16'.9	03'.5	230° 43'.9	00'.1
	14	100° 13'.1	12° 14'.5	17'.9	41° 34'.0	23'.6	16° 18'.7	03'.6	245° 46'.5	00'.0
	15	115° 15'.5	27° 13'.6	18'.0	56° 34'.7	24'.0	31° 20'.6	03'.6	260° 49'.1	00'.0
	16	130° 18'.0	42° 12'.7	18'.1	71° 35'.3	24'.4	46° 22'.4	03'.6	275° 51'.7	10° 59'.9 S
	17	145° 20'.5	57° 11'.9	18'.3	86° 35'.9	24'.8	61° 24'.3	03'.6	290° 54'.3	59'.9
	18	160° 22'.9	72° 11'.0	18'.4	101° 36'.5	25'.2	76° 26'.1	03'.7	305° 56'.9	59'.9
	19	175° 25'.4	87° 10'.1	18'.5	116° 37'.1	25'.6	91° 28'.0	03'.7	320° 59'.5	59'.8
	20	190° 27'.9	102° 09'.2	18'.6	131° 37'.7	26'.0	106° 29'.8	03'.7	336° 02'.1	59'.8
	21	205° 30'.3	117° 08'.3	18'.8	146° 38'.3	26'.4	121° 31'.7	03'.8	351° 04'.7	59'.8
	22	220° 32'.8	132° 07'.4	18'.9	161° 38'.9	26'.8	136° 33'.5	03'.8	6° 07'.3	59'.7
	23	235° 35'.2	147° 06'.5	19'.0	176° 39'.5	27'.2	151° 35'.4	03'.8	21° 09'.9	59'.7
2 Sunday	00	250° 37'.7	162° 05'.6	24° 19'.1 N	191° 40'.1	20° 27'.6 N	166° 37'.2	23° 03'.8 N	36° 12'.5	10° 59'.7 S
	01	265° 40'.2	177° 04'.7	19'.3	206° 40'.7	28'.0	181° 39'.1	03'.9	51° 15'.1	59'.6
	02	280° 42'.6	192° 03'.9	19'.4	221° 41'.3	28'.4	196° 40'.9	03'.9	66° 17'.7	59'.6
	03	295° 45'.1	207° 03'.0	19'.5	236° 41'.9	28'.8	211° 42'.8	03'.9	81° 20'.3	59'.5
	04	310° 47'.6	222° 02'.1	19'.6	251° 42'.6	29'.1	226° 44'.6	03'.9	96° 22'.9	59'.5
	05	325° 50'.0	237° 01'.2	19'.7	266° 43'.2	29'.5	241° 46'.4	04'.0	111° 25'.5	59'.5
	06	340° 52'.5	252° 00'.3	19'.8	281° 43'.8	29'.9	256° 48'.3	04'.0	126° 28'.1	59'.4
	07	355° 55'.0	266° 59'.4	20'.0	296° 44'.4	30'.3	271° 50'.1	04'.0	141° 30'.7	59'.4
	08	10° 57'.4	281° 58'.5	20'.1	311° 45'.0	30'.7	286° 52'.0	04'.1	156° 33'.3	59'.4
	09	25° 59'.9	296° 57'.6	20'.2	326° 45'.6	31'.1	301° 53'.8	04'.1	171° 35'.9	59'.3
	10	41° 02'.4	311° 56'.7	20'.3	341° 46'.2	31'.5	316° 55'.7	04'.1	186° 38'.5	59'.3
	11	56° 04'.8	326° 55'.8	20'.4	356° 46'.8	31'.9	331° 57'.5	04'.1	201° 41'.0	59'.3
	12	71° 07'.3	341° 55'.0	24° 20'.5 N	11° 47'.4	20° 32'.3 N	346° 59'.4	23° 04'.2 N	216° 43'.6	10° 59'.2 S
	13	86° 09'.7	356° 54'.1	20'.6	26° 48'.0	32'.6	2° 01'.2	04'.2	231° 46'.2	59'.2
	14	101° 12'.2	11° 53'.2	20'.7	41° 48'.6	33'.0	17° 03'.1	04'.2	246° 48'.8	59'.1
	15	116° 14'.7	26° 52'.3	20'.8	56° 49'.2	33'.4	32° 04'.9	04'.2	261° 51'.4	59'.1
	16	131° 17'.1	41° 51'.4	20'.9	71° 49'.8	33'.8	47° 06'.8	04'.3	276° 54'.0	59'.1
	17	146° 19'.6	56° 50'.5	21'.0	86° 50'.4	34'.2	62° 08'.6	04'.3	291° 56'.6	59'.0
	18	161° 22'.1	71° 49'.6	21'.1	101° 51'.0	34'.6	77° 10'.5	04'.3	306° 59'.2	59'.0
	19	176° 24'.5	86° 48'.7	21'.2	116° 51'.6	35'.0	92° 12'.3	04'.4	322° 01'.8	59'.0
	20	191° 27'.0	101° 47'.8	21'.3	131° 52'.3	35'.4	107° 14'.2	04'.4	337° 04'.4	58'.9
	21	206° 29'.5	116° 46'.9	21'.4	146° 52'.9	35'.7	122° 16'.0	04'.4	352° 07'.0	58'.9
	22	221° 31'.9	131° 46'.1	21'.5	161° 53'.5	36'.1	137° 17'.8	04'.4	7° 09'.6	58'.9
	23	236° 34'.4	146° 45'.2	21'.6	176° 54'.1	36'.5	152° 19'.7	04'.5	22° 12'.2	58'.8
		M.P. 07:16	v -0'.9	d 0'.1	v 0'.6	d 0'.4	v 1'.8	d 0'.0	v 2'.6	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.0 S
Achernar	335° 27'.3	57° 09'.9 S
Acrux	173° 09'.0	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.8	16° 32'.0 N
Alioth	166° 20'.5	55° 53'.4 N
Alkaid	152° 58'.6	49° 14'.9 N
Alnair	27° 43'.7	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.6	29° 09'.8 N
Altair	62° 08'.0	8° 54'.3 N
Ankaa	353° 16'.0	42° 13'.8 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.2	69° 03'.0 S
Avior	234° 18'.4	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.7	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.5 S
Capella	280° 35'.0	46° 00'.5 N
Deneb	49° 31'.2	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.1	17° 54'.7 S
Dubhe	193° 51'.8	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.3 N
Enif	33° 47'.0	9° 56'.3 N
Fomalhaut	15° 24'.0	29° 32'.8 S
Gacrux	172° 00'.6	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.3	60° 26'.4 S
Hamal	328° 01'.0	23° 31'.4 N
Kaus Aust.	83° 43'.5	34° 22'.5 S
Kochab	137° 19'.1	74° 06'.2 N
Markab	13° 38'.4	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.0	69° 46'.8 S
Mirfak	308° 40'.8	49° 54'.3 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 19'.0	56° 41'.1 S
Polaris	318° 10'.9	89° 19'.1 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.8	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.6	43° 29'.6 S
Vega	80° 38'.6	38° 47'.8 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	272° 48'.4	13:11
Mars	301° 47'.0	11:14
Jupiter	276° 14'.3	12:55
Saturn	145° 31'.6	21:36

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
31 Friday 00	180° 35'.9	21° 54'.2 N	278° 38'.8	10'.9	6° 46'.3 S	11'.2	58'.4
01	195° 35'.8	54'.6	293° 08'.7	10'.9	35'.1	11'.2	58'.3
02	210° 35'.7	55'.0	307° 38'.6	10'.9	23'.9	11'.3	
03	225° 35'.6	55'.3	322° 08'.5	11'.1	12'.6	11'.2	
04	240° 35'.5	55'.7	336° 38'.6	11'.1	01'.4	11'.3	58'.2
05	255° 35'.5	56'.0	351° 08'.7	11'.1	5° 50'.1 S	11'.3	
06	270° 35'.4	56'.4	5° 38'.8	11'.2	38'.8	11'.3	
07	285° 35'.3	56'.7	20° 09'.0	11'.3	27'.5	11'.4	58'.1
08	300° 35'.2	57'.1	34° 39'.3	11'.3	16'.1	11'.3	
09	315° 35'.1	57'.4	49° 09'.6	11'.4	04'.8	11'.4	
10	330° 35'.0	57'.8	63° 40'.0	11'.4	4° 53'.4 S	11'.4	58'.0
11	345° 34'.9	58'.1	78° 10'.4	11'.5	42'.0	11'.3	
12	0° 34'.8	21° 58'.5 N	92° 40'.9	11'.6	4° 30'.7 S	11'.4	58'.0
13	15° 34'.7	58'.8	107° 11'.5	11'.6	19'.3	11'.4	57'.9
14	30° 34'.6	59'.2	121° 42'.1	11'.7	07'.9	11'.5	
15	45° 34'.5	59'.5	136° 12'.8	11'.7	3° 56'.4 S	11'.4	
16	60° 34'.4	59'.9	150° 43'.5	11'.7	45'.0	11'.4	57'.8
17	75° 34'.3	22° 00'.2 N	165° 14'.2	11'.9	33'.6	11'.4	
18	90° 34'.2	00'.6	179° 45'.1	11'.8	22'.2	11'.5	
19	105° 34'.2	00'.9	194° 15'.9	11'.9	10'.7	11'.4	57'.7
20	120° 34'.1	01'.2	208° 46'.8	12'.0	2° 59'.3 S	11'.4	
21	135° 34'.0	01'.6	223° 17'.8	12'.0	47'.9	11'.5	
22	150° 33'.9	01'.9	237° 48'.8	12'.1	36'.4	11'.4	57'.6
23	165° 33'.8	02'.3	252° 19'.9	12'.1	25'.0	11'.4	
1 Saturday 00	180° 33'.7	22° 02'.6 N	266° 51'.0	12'.1	2° 13'.6 S	11'.5	57'.6
01	195° 33'.6	02'.9	281° 22'.1	12'.2	02'.1	11'.4	57'.5
02	210° 33'.5	03'.3	295° 53'.3	12'.3	1° 50'.7 S	11'.4	
03	225° 33'.4	03'.6	310° 24'.6	12'.2	39'.3	11'.4	
04	240° 33'.3	04'.0	324° 55'.8	12'.3	27'.9	11'.4	57'.4
05	255° 33'.2	04'.3	339° 27'.1	12'.4	16'.5	11'.4	
06	270° 33'.1	04'.6	353° 58'.5	12'.4	05'.1	11'.4	
07	285° 33'.0	05'.0	8° 29'.9	12'.4	0° 53'.7 S	11'.4	57'.3
08	300° 32'.9	05'.3	23° 01'.3	12'.5	42'.3	11'.4	
09	315° 32'.8	05'.6	37° 32'.8	12'.5	30'.9	11'.4	
10	330° 32'.7	06'.0	52° 04'.3	12'.5	19'.5	11'.3	57'.2
11	345° 32'.6	06'.3	66° 35'.8	12'.6	08'.2	11'.4	
12	0° 32'.5	22° 06'.6 N	81° 07'.4	12'.6	0° 03'.2 N	11'.3	57'.2
13	15° 32'.4	07'.0	95° 39'.0	12'.7	14'.5	11'.4	57'.1
14	30° 32'.3	07'.3	110° 10'.7	12'.7	25'.9	11'.3	
15	45° 32'.2	07'.6	124° 42'.4	12'.7	37'.2	11'.3	
16	60° 32'.1	08'.0	139° 14'.1	12'.7	48'.5	11'.2	57'.0
17	75° 32'.0	08'.3	153° 45'.8	12'.8	59'.7	11'.3	
18	90° 31'.9	08'.6	168° 17'.6	12'.8	1° 11'.0 N	11'.2	
19	105° 31'.8	08'.9	182° 49'.4	12'.8	22'.2	11'.2	56'.9
20	120° 31'.7	09'.3	197° 21'.2	12'.9	33'.4	11'.3	
21	135° 31'.6	09'.6	211° 53'.1	12'.8	44'.7	11'.1	
22	150° 31'.6	09'.9	226° 24'.9	12'.9	55'.8	11'.2	56'.8
23	165° 31'.5	10'.3	240° 56'.8	13'.0	2° 07'.0 N	11'.1	
2 Sunday 00	180° 31'.4	22° 10'.6 N	255° 28'.8	12'.9	2° 18'.1 N	11'.2	56'.8
01	195° 31'.3	10'.9	270° 00'.7	13'.0	29'.3	11'.1	
02	210° 31'.2	11'.2	284° 32'.7	13'.0	40'.4	11'.0	56'.7
03	225° 31'.1	11'.5	299° 04'.7	13'.0	51'.4	11'.1	
04	240° 31'.0	11'.9	313° 36'.7	13'.1	3° 02'.5 N	11'.0	
05	255° 30'.9	12'.2	328° 08'.8	13'.0	13'.5	11'.0	56'.6
06	270° 30'.8	12'.5	342° 40'.8	13'.1	24'.5	11'.0	
07	285° 30'.7	12'.8	357° 12'.9	13'.1	35'.5	10'.9	
08	300° 30'.6	13'.1	11° 45'.0	13'.1	46'.4	10'.9	56'.5
09	315° 30'.5	13'.5	26° 17'.1	13'.1	57'.3	10'.9	
10	330° 30'.4	13'.8	40° 49'.2	13'.2	4° 08'.2 N	10'.8	
11	345° 30'.3	14'.1	55° 21'.4	13'.1	19'.0	10'.9	
12	0° 30'.1	22° 14'.4 N	69° 53'.5	13'.2	4° 29'.9 N	10'.8	56'.4
13	15° 30'.0	14'.7	84° 25'.7	13'.2	40'.7	10'.7	
14	30° 29'.9	15'.1	98° 57'.9	13'.2	51'.4	10'.7	
15	45° 29'.8	15'.4	113° 30'.1	13'.2	5° 02'.1 N	10'.7	56'.3
16	60° 29'.7	15'.7	128° 02'.3	13'.2	12'.8	10'.7	
17	75° 29'.6	16'.0	142° 34'.5	13'.3	23'.5	10'.6	
18	90° 29'.5	16'.3	157° 06'.8	13'.2	34'.1	10'.6	
19	105° 29'.4	16'.6	171° 39'.0	13'.3	44'.7	10'.6	56'.2
20	120° 29'.3	16'.9	186° 11'.3	13'.2	55'.3	10'.5	
21	135° 29'.2	17'.2	200° 43'.5	13'.3	6° 05'.8 N	10'.5	
22	150° 29'.1	17'.5	215° 15'.8	13'.3	16'.3	10'.4	56'.1
23	165° 29'.0	17'.9	229° 48'.1	13'.3	26'.7	10'.4	
	SD 15'.8	d 0'.3	SD 15'.8		15'.6	15'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 31	Moonrise 1	Moonrise 2
N 72°	-	-	-	00:53	00:41	00:31
N 70°	-	-	-	00:43	00:39	00:34
68°	-	-	-	00:35	00:36	00:37
66°	-	-	01:12	00:29	00:34	00:39
64°	-	-	01:58	00:23	00:32	00:41
62°	-	-	02:27	00:18	00:31	00:42
60°	-	01:26	02:49	00:14	00:29	00:44
N 58°	-	02:00	03:07	00:10	00:28	00:45
56°	-	02:24	03:22	00:07	00:27	00:46
54°	01:18	02:44	03:35	00:04	00:26	00:47
52°	01:50	02:59	03:46	00:01	00:25	00:48
50°	02:13	03:13	03:56	-	00:24	00:49
45°	02:53	03:40	04:17	-	00:23	00:51
N 40°	03:21	04:01	04:33	-	00:21	00:52
35°	03:42	04:18	04:47	-	00:20	00:53
30°	04:00	04:32	04:59	-	00:19	00:55
20°	04:27	04:56	05:20	-	00:17	00:57
N 10°	04:48	05:15	05:38	-	00:15	00:59
0°	05:06	05:32	05:54	-	00:14	01:00
S 10°	05:22	05:48	06:11	-	00:12	01:02
20°	05:37	06:04	06:28	-	00:10	01:04
30°	05:52	06:22	06:48	-	00:08	01:07
35°	06:00	06:31	06:59	-	00:07	01:08
40°	06:09	06:42	07:12	-	00:06	01:09
45°	06:18	06:55	07:28	-	00:05	01:11
S 50°	06:29	07:10	07:47	-	00:03	01:13
52°	06:33	07:16	07:56	-	00:02	01:14
54°	06:38	07:24	08:06	-	00:01	01:15
56°	06:44	07:32	08:18	-	00:00	01:16
58°	06:50	07:41	08:31	23:59	-	01:18
S 60°	06:57	07:52	08:47	23:58	-	01:19
S 62°	07:04	08:04	09:05	23:57	-	01:21

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 31	Moonset 1	Moonset 2
N 72°	-	-	-	10:46	12:37	14:25
N 70°	-	-	-	10:53	12:37	14:18
68°	-	-	-	10:59	12:37	14:12
66°	22:48	-	-	11:04	12:37	14:07
64°	22:00	-	-	11:08	12:37	14:03
62°	21:30	-	-	11:11	12:37	14:00
60°	21:08	22:33	-	11:14	12:37	13:57
N 58°	20:50	21:57	-	11:17	12:37	13:54
56°	20:35	21:33	-	11:19	12:37	13:52
54°	20:22	21:13	22:40	11:21	12:37	13:50
52°	20:10	20:57	22:07	11:23	12:37	13:48
50°	20:00	20:43	21:44	11:25	12:37	13:46
45°	19:40	20:16	21:04	11:29	12:37	13:42
N 40°	19:23	19:55	20:35	11:32	12:37	13:39
35°	19:09	19:38	20:14	11:35	12:37	13:36
30°	18:57	19:24	19:56	11:37	12:36	13:34
20°	18:36	19:00	19:29	11:41	12:36	13:30
N 10°	18:18	18:41	19:08	11:45	12:36	13:26
0°	18:01	18:24	18:50	11:48	12:36	13:23
S 10°	17:45	18:08	18:34	11:52	12:36	13:19
20°	17:28	17:51	18:19	11:55	12:36	13:15
30°	17:08	17:34	18:03	11:59	12:36	13:11
35°	16:56	17:24	17:55	12:01	12:36	13:09
40°	16:43	17:13	17:47	12:04	12:35	13:06
45°	16:27	17:01	17:37	12:07	12:35	13:03
S 50°	16:08	16:46	17:27	12:10	12:35	12:59
52°	15:59	16:39	17:22	12:12	12:35	12:57
54°	15:49	16:32	17:17	12:13	12:35	12:56
56°	15:37	16:23	17:11	12:15	12:35	12:53
58°	15:24	16:14	17:05	12:17	12:35	12:51
S 60°	15:09	16:03	16:59	12:20	12:34	12:49
S 62°	14:50	15:51	16:51	12:22	12:34	12:46

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
31	2 24	2 19	11:58	05:37	18:01	21d 53%
1	2 15	2 10	11:58	06:25	18:48	22d 43%
2	2 06	2 01	11:58	07:11	19:34	23d 32%

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2013 June 3, 4, 5 (Mon, Tue, Wed)

GMT		ARIES	VENUS -3.9		MARS +1.4		JUPITER -1.9		SATURN +0.3	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
3 Monday	00	251° 36'.9	161° 44'.3	24° 21'.7 N	191° 54'.7	20° 36'.9 N	167° 21'.5	23° 04'.5 N	37° 14'.8	10° 58'.8 S
	01	266° 39'.3	176° 43'.4	21'.8	206° 55'.3	37'.3	182° 23'.4	04'.5	52° 17'.4	58'.7
	02	281° 41'.8	191° 42'.5	21'.9	221° 55'.9	37'.7	197° 25'.2	04'.5	67° 20'.0	58'.7
	03	296° 44'.2	206° 41'.6	22'.0	236° 56'.5	38'.0	212° 27'.1	04'.6	82° 22'.6	58'.7
	04	311° 46'.7	221° 40'.7	22'.0	251° 57'.1	38'.4	227° 28'.9	04'.6	97° 25'.1	58'.6
	05	326° 49'.2	236° 39'.8	22'.1	266° 57'.7	38'.8	242° 30'.8	04'.6	112° 27'.7	58'.6
	06	341° 51'.6	251° 38'.9	22'.2	281° 58'.3	39'.2	257° 32'.6	04'.7	127° 30'.3	58'.6
	07	356° 54'.1	266° 38'.0	22'.3	296° 58'.9	39'.6	272° 34'.5	04'.7	142° 32'.9	58'.5
	08	11° 56'.6	281° 37'.1	22'.4	311° 59'.5	39'.9	287° 36'.3	04'.7	157° 35'.5	58'.5
	09	26° 59'.0	296° 36'.3	22'.5	327° 00'.1	40'.3	302° 38'.2	04'.7	172° 38'.1	58'.5
	10	42° 01'.5	311° 35'.4	22'.5	342° 00'.7	40'.7	317° 40'.0	04'.8	187° 40'.7	58'.4
	11	57° 04'.0	326° 34'.5	22'.6	357° 01'.3	41'.1	332° 41'.9	04'.8	202° 43'.3	58'.4
	12	72° 06'.4	341° 33'.6	24° 22'.7 N	12° 01'.9	20° 41'.5 N	347° 43'.7	23° 04'.8 N	217° 45'.9	10° 58'.4 S
	13	87° 08'.9	356° 32'.7	22'.8	27° 02'.5	41'.8	2° 45'.5	04'.8	232° 48'.5	58'.3
	14	102° 11'.3	11° 31'.8	22'.8	42° 03'.1	42'.2	17° 47'.4	04'.9	247° 51'.1	58'.3
	15	117° 13'.8	26° 30'.9	22'.9	57° 03'.8	42'.6	32° 49'.2	04'.9	262° 53'.7	58'.3
	16	132° 16'.3	41° 30'.0	23'.0	72° 04'.4	43'.0	47° 51'.1	04'.9	277° 56'.3	58'.2
	17	147° 18'.7	56° 29'.1	23'.1	87° 05'.0	43'.4	62° 52'.9	04'.9	292° 58'.8	58'.2
	18	162° 21'.2	71° 28'.2	23'.1	102° 05'.6	43'.7	77° 54'.8	05'.0	308° 01'.4	58'.1
	19	177° 23'.7	86° 27'.3	23'.2	117° 06'.2	44'.1	92° 56'.6	05'.0	323° 04'.0	58'.1
	20	192° 26'.1	101° 26'.4	23'.3	132° 06'.8	44'.5	107° 58'.5	05'.0	338° 06'.6	58'.1
	21	207° 28'.6	116° 25'.6	23'.3	147° 07'.4	44'.9	123° 00'.3	05'.0	353° 09'.2	58'.0
	22	222° 31'.1	131° 24'.7	23'.4	162° 08'.0	45'.2	138° 02'.2	05'.1	8° 11'.8	58'.0
	23	237° 33'.5	146° 23'.8	23'.5	177° 08'.6	45'.6	153° 04'.0	05'.1	23° 14'.4	58'.0
4 Tuesday	00	252° 36'.0	161° 22'.9	24° 23'.5 N	192° 09'.2	20° 46'.0 N	168° 05'.9	23° 05'.1 N	38° 17'.0	10° 57'.9 S
	01	267° 38'.5	176° 22'.0	23'.6	207° 09'.8	46'.4	183° 07'.7	05'.2	53° 19'.6	57'.9
	02	282° 40'.9	191° 21'.1	23'.6	222° 10'.4	46'.7	198° 09'.5	05'.2	68° 22'.2	57'.9
	03	297° 43'.4	206° 20'.2	23'.7	237° 11'.0	47'.1	213° 11'.4	05'.2	83° 24'.8	57'.8
	04	312° 45'.8	221° 19'.3	23'.8	252° 11'.6	47'.5	228° 13'.2	05'.2	98° 27'.3	57'.8
	05	327° 48'.3	236° 18'.4	23'.8	267° 12'.2	47'.9	243° 15'.1	05'.3	113° 29'.9	57'.8
	06	342° 50'.8	251° 17'.5	23'.9	282° 12'.8	48'.2	258° 16'.9	05'.3	128° 32'.5	57'.7
	07	357° 53'.2	266° 16'.6	23'.9	297° 13'.4	48'.6	273° 18'.8	05'.3	143° 35'.1	57'.7
	08	12° 55'.7	281° 15'.7	24'.0	312° 14'.0	49'.0	288° 20'.6	05'.3	158° 37'.7	57'.7
	09	27° 58'.2	296° 14'.9	24'.0	327° 14'.6	49'.4	303° 22'.5	05'.4	173° 40'.3	57'.6
	10	43° 00'.6	311° 14'.0	24'.1	342° 15'.2	49'.7	318° 24'.3	05'.4	188° 42'.9	57'.6
	11	58° 03'.1	326° 13'.1	24'.1	357° 15'.8	50'.1	333° 26'.2	05'.4	203° 45'.5	57'.6
	12	73° 05'.6	341° 12'.2	24° 24'.2 N	12° 16'.4	20° 50'.5 N	348° 28'.0	23° 05'.4 N	218° 48'.1	10° 57'.5 S
	13	88° 08'.0	356° 11'.3	24'.2	27° 17'.0	50'.8	3° 29'.8	05'.5	233° 50'.7	57'.5
	14	103° 10'.5	11° 10'.4	24'.3	42° 17'.6	51'.2	18° 31'.7	05'.5	248° 53'.2	57'.5
	15	118° 13'.0	26° 09'.5	24'.3	57° 18'.3	51'.6	33° 33'.5	05'.5	263° 55'.8	57'.4
	16	133° 15'.4	41° 08'.6	24'.3	72° 18'.9	52'.0	48° 35'.4	05'.5	278° 58'.4	57'.4
	17	148° 17'.9	56° 07'.7	24'.4	87° 19'.5	52'.3	63° 37'.2	05'.6	294° 01'.0	57'.4
	18	163° 20'.3	71° 06'.8	24'.4	102° 20'.1	52'.7	78° 39'.1	05'.6	309° 03'.6	57'.3
	19	178° 22'.8	86° 05'.9	24'.5	117° 20'.7	53'.1	93° 40'.9	05'.6	324° 06'.2	57'.3
	20	193° 25'.3	101° 05'.0	24'.5	132° 21'.3	53'.4	108° 42'.8	05'.6	339° 08'.8	57'.3
	21	208° 27'.7	116° 04'.2	24'.5	147° 21'.9	53'.8	123° 44'.6	05'.7	354° 11'.4	57'.2
	22	223° 30'.2	131° 03'.3	24'.6	162° 22'.5	54'.2	138° 46'.5	05'.7	9° 13'.9	57'.2
	23	238° 32'.7	146° 02'.4	24'.6	177° 23'.1	54'.5	153° 48'.3	05'.7	24° 16'.5	57'.2
5 Wednesday	00	253° 35'.1	161° 01'.5	24° 24'.6 N	192° 23'.7	20° 54'.9 N	168° 50'.1	23° 05'.7 N	39° 19'.1	10° 57'.1 S
	01	268° 37'.6	176° 00'.6	24'.7	207° 24'.3	55'.3	183° 52'.0	05'.8	54° 21'.7	57'.1
	02	283° 40'.1	190° 59'.7	24'.7	222° 24'.9	55'.6	198° 53'.8	05'.8	69° 24'.3	57'.1
	03	298° 42'.5	205° 58'.8	24'.7	237° 25'.5	56'.0	213° 55'.7	05'.8	84° 26'.9	57'.0
	04	313° 45'.0	220° 57'.9	24'.7	252° 26'.1	56'.4	228° 57'.5	05'.8	99° 29'.5	57'.0
	05	328° 47'.4	235° 57'.0	24'.8	267° 26'.7	56'.7	243° 59'.4	05'.9	114° 32'.1	57'.0
	06	343° 49'.9	250° 56'.1	24'.8	282° 27'.3	57'.1	259° 01'.2	05'.9	129° 34'.6	56'.9
	07	358° 52'.4	265° 55'.2	24'.8	297° 27'.9	57'.5	274° 03'.1	05'.9	144° 37'.2	56'.9
	08	13° 54'.8	280° 54'.3	24'.8	312° 28'.5	57'.8	289° 04'.9	05'.9	159° 39'.8	56'.9
	09	28° 57'.3	295° 53'.5	24'.9	327° 29'.1	58'.2	304° 06'.7	06'.0	174° 42'.4	56'.8
	10	43° 59'.8	310° 52'.6	24'.9	342° 29'.7	58'.5	319° 08'.6	06'.0	189° 45'.0	56'.8
	11	59° 02'.2	325° 51'.7	24'.9	357° 30'.3	58'.9	334° 10'.4	06'.0	204° 47'.6	56'.8
	12	74° 04'.7	340° 50'.8	24° 24'.9 N	12° 30'.9	20° 59'.3 N	349° 12'.3	23° 06'.0 N	219° 50'.2	10° 56'.7 S
	13	89° 07'.2	355° 49'.9	24'.9	27° 31'.5	59'.6	4° 14'.1	06'.1	234° 52'.8	56'.7
	14	104° 09'.6	10° 49'.0	25'.0	42° 32'.1	21° 00'.0 N	19° 16'.0	06'.1	249° 55'.3	56'.7
	15	119° 12'.1	25° 48'.1	25'.0	57° 32'.7	00'.4	34° 17'.8	06'.1	264° 57'.9	56'.6
	16	134° 14'.6	40° 47'.2	25'.0	72° 33'.3	00'.7	49° 19'.7	06'.1	280° 00'.5	56'.6
	17	149° 17'.0	55° 46'.3	25'.0	87° 33'.9	01'.1	64° 21'.5	06'.2	295° 03'.1	56'.6
	18	164° 19'.5	70° 45'.4	25'.0	102° 34'.5	01'.4	79° 23'.3	06'.2	310° 05'.7	56'.5
	19	179° 21'.9	85° 44'.5	25'.0	117° 35'.1	01'.8	94° 25'.2	06'.2	325° 08'.3	56'.5
	20	194° 24'.4	100° 43'.7	25'.0	132° 35'.7	02'.2	109° 27'.0	06'.2	340° 10'.9	56'.5
	21	209° 26'.9	115° 42'.8	25'.0	147° 36'.3	02'.5	124° 28'.9	06'.3	355° 13'.4	56'.4
	22	224° 29'.3	130° 41'.9	25'.0	162° 36'.9	02'.9	139° 30'.7	06'.3	10° 16'.0	56'.4
	23	239° 31'.8	145° 41'.0	25'.0	177° 37'.5	03'.2	154° 32'.6	06'.3	25° 18'.6	56'.4
		M.P. 07:04	v -0'.9	d 0'.0	v 0'.6	d 0'.4	v 1'.8	d 0'.0	v 2'.6	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.8	40° 15'.0 S
Achernar	335° 27'.2	57° 09'.9 S
Acrux	173° 09'.0	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.5	55° 53'.4 N
Alkaid	152° 58'.6	49° 14'.9 N
Alnair	27° 43'.7	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.6	29° 09'.8 N
Altair	62° 08'.0	8° 54'.3 N
Ankaa	353° 15'.9	42° 13'.8 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.1	69° 03'.0 S
Avior	234° 18'.4	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.7	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.4 S
Capella	280° 35'.0	46° 00'.5 N
Deneb	49° 31'.2	45° 19'.6 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.1	17° 54'.7 S
Dubhe	193° 51'.8	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.3 N
Enif	33° 47'.0	9° 56'.3 N
Fomalhaut	15° 24'.0	29° 32'.8 S
Gacrux	172° 00'.6	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.5 S
Hamal	328° 01'.0	23° 31'.4 N
Kaus Aust.	83° 43'.5	34° 22'.5 S
Kochab	137° 19'.1	74° 06'.2 N
Markab	13° 38'.3	15° 16'.6 N
Menkar	314° 15'.4	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.0	69° 46'.8 S
Mirfak	308° 40'.8	49° 54'.3 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.9	56° 41'.1 S
Polaris	318° 10'.0	89° 19'.1 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.7	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.6	43° 29'.6 S
Vega	80° 38'.6	38° 47'.8 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	268° 46'.9	13:15
Mars	299° 33'.2	11:11
Jupiter	275° 29'.9	12:46
Saturn	145° 41'.0	21:23

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
3 Monday 00	180° 28'.9	22° 18'.2 N	244° 20'.4	13'.3	6° 37'.1 N	10'.4	56'.1
01	195° 28'.8	18'.5	258° 52'.7	13'.3	47'.5	10'.3	
02	210° 28'.7	18'.8	273° 25'.0	13'.3	57'.8	10'.3	56'.0
03	225° 28'.6	19'.1	287° 57'.3	13'.3	7° 08'.1 N	10'.2	
04	240° 28'.5	19'.4	302° 29'.6	13'.3	18'.3	10'.2	
05	255° 28'.4	19'.7	317° 01'.9	13'.3	28'.5	10'.2	
06	270° 28'.3	20'.0	331° 34'.2	13'.3	38'.7	10'.1	55'.9
07	285° 28'.2	20'.3	346° 06'.5	13'.3	48'.8	10'.0	
08	300° 28'.1	20'.6	0° 38'.8	13'.3	58'.8	10'.1	
09	315° 28'.0	20'.9	15° 11'.1	13'.3	8° 08'.9 N	9'.9	
10	330° 27'.9	21'.2	29° 43'.4	13'.3	18'.8	10'.0	55'.8
11	345° 27'.8	21'.5	44° 15'.7	13'.4	28'.8	9'.9	
12	0° 27'.7	22° 21'.8 N	58° 48'.1	13'.3	8° 38'.7 N	9'.8	55'.8
13	15° 27'.6	22'.1	73° 20'.4	13'.3	48'.5	9'.8	
14	30° 27'.5	22'.4	87° 52'.7	13'.3	58'.3	9'.7	55'.7
15	45° 27'.4	22'.7	102° 25'.0	13'.3	9° 08'.0 N	9'.7	
16	60° 27'.2	23'.0	116° 57'.3	13'.3	17'.7	9'.7	
17	75° 27'.1	23'.3	131° 29'.6	13'.3	27'.4	9'.6	
18	90° 27'.0	23'.6	146° 01'.9	13'.2	37'.0	9'.5	55'.6
19	105° 26'.9	23'.9	160° 34'.1	13'.3	46'.5	9'.5	
20	120° 26'.8	24'.2	175° 06'.4	13'.3	56'.0	9'.4	
21	135° 26'.7	24'.5	189° 38'.7	13'.3	10° 05'.4 N	9'.4	
22	150° 26'.6	24'.8	204° 11'.0	13'.2	14'.8	9'.4	55'.5
23	165° 26'.5	25'.1	218° 43'.2	13'.3	24'.2	9'.2	
4 Tuesday 00	180° 26'.4	22° 25'.4 N	233° 15'.5	13'.2	10° 33'.4 N	9'.3	55'.5
01	195° 26'.3	25'.7	247° 47'.7	13'.3	42'.7	9'.1	
02	210° 26'.2	25'.9	262° 20'.0	13'.2	51'.8	9'.1	
03	225° 26'.1	26'.2	276° 52'.2	13'.2	11° 00'.9 N	9'.1	55'.4
04	240° 26'.0	26'.5	291° 24'.4	13'.2	10'.0	9'.0	
05	255° 25'.9	26'.8	305° 56'.6	13'.2	19'.0	8'.9	
06	270° 25'.7	27'.1	320° 28'.8	13'.2	27'.9	8'.9	
07	285° 25'.6	27'.4	335° 01'.0	13'.2	36'.8	8'.9	
08	300° 25'.5	27'.7	349° 33'.2	13'.1	45'.7	8'.7	55'.3
09	315° 25'.4	28'.0	4° 05'.3	13'.2	54'.4	8'.7	
10	330° 25'.3	28'.2	18° 37'.5	13'.1	12° 03'.1 N	8'.7	
11	345° 25'.2	28'.5	33° 09'.6	13'.1	11'.8	8'.6	
12	0° 25'.1	22° 28'.8 N	47° 41'.7	13'.2	12° 20'.4 N	8'.5	55'.2
13	15° 25'.0	29'.1	62° 13'.9	13'.1	28'.9	8'.5	
14	30° 24'.9	29'.4	76° 46'.0	13'.0	37'.4	8'.4	
15	45° 24'.8	29'.7	91° 18'.0	13'.1	45'.8	8'.3	
16	60° 24'.7	29'.9	105° 50'.1	13'.1	54'.1	8'.3	
17	75° 24'.6	30'.2	120° 22'.2	13'.0	13° 02'.4 N	8'.2	55'.1
18	90° 24'.4	30'.5	134° 54'.2	13'.0	10'.6	8'.1	
19	105° 24'.3	30'.8	149° 26'.2	13'.1	18'.7	8'.1	
20	120° 24'.2	31'.1	163° 58'.3	13'.0	26'.8	8'.0	
21	135° 24'.1	31'.3	178° 30'.3	12'.9	34'.8	8'.0	
22	150° 24'.0	31'.6	193° 02'.2	13'.0	42'.8	7'.8	
23	165° 23'.9	31'.9	207° 34'.2	13'.0	50'.6	7'.9	55'.0
5 Wednesday 00	180° 23'.8	22° 32'.2 N	222° 06'.2	12'.9	13° 58'.5 N	7'.7	55'.0
01	195° 23'.7	32'.4	236° 38'.1	12'.9	14° 06'.2 N	7'.7	
02	210° 23'.6	32'.7	251° 10'.0	12'.9	13'.9	7'.6	
03	225° 23'.4	33'.0	265° 41'.9	12'.9	21'.5	7'.5	
04	240° 23'.3	33'.3	280° 13'.8	12'.9	29'.0	7'.5	54'.9
05	255° 23'.2	33'.5	294° 45'.7	12'.8	36'.5	7'.4	
06	270° 23'.1	33'.8	309° 17'.5	12'.8	43'.9	7'.3	
07	285° 23'.0	34'.1	323° 49'.3	12'.8	51'.2	7'.3	
08	300° 22'.9	34'.3	338° 21'.1	12'.8	58'.5	7'.2	
09	315° 22'.8	34'.6	352° 52'.9	12'.8	15° 05'.7 N	7'.1	
10	330° 22'.7	34'.9	7° 24'.7	12'.8	12'.8	7'.0	54'.8
11	345° 22'.6	35'.2	21° 56'.5	12'.7	19'.8	7'.0	
12	0° 22'.4	22° 35'.4 N	36° 28'.2	12'.7	15° 26'.8 N	6'.9	54'.8
13	15° 22'.3	35'.7	50° 59'.9	12'.7	33'.7	6'.8	
14	30° 22'.2	36'.0	65° 31'.6	12'.7	40'.5	6'.7	
15	45° 22'.1	36'.2	80° 03'.3	12'.7	47'.2	6'.7	
16	60° 22'.0	36'.5	94° 35'.0	12'.6	53'.9	6'.6	54'.7
17	75° 21'.9	36'.7	109° 06'.6	12'.7	16° 00'.5 N	6'.5	
18	90° 21'.8	37'.0	123° 38'.3	12'.6	07'.0	6'.4	
19	105° 21'.6	37'.3	138° 09'.9	12'.6	13'.4	6'.4	
20	120° 21'.5	37'.5	152° 41'.5	12'.6	19'.8	6'.3	
21	135° 21'.4	37'.8	167° 13'.1	12'.5	26'.1	6'.2	
22	150° 21'.3	38'.1	181° 44'.6	12'.5	32'.3	6'.1	54'.6
23	165° 21'.2	38'.3	196° 16'.1	12'.6	38'.4	6'.1	
	SD 15'.8	d 0'.3	SD 15'.2		15'.1	14'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5
N 72°	-	-	-	00:20	00:09 / 23:54	23:30
N 70°	-	-	-	00:30	00:25	00:21
68°	-	-	-	00:37	00:38	00:41
66°	-	-	00:58	00:44	00:49	00:57
64°	-	-	01:51	00:49	00:59	01:11
62°	-	-	02:22	00:54	01:07	01:22
60°	-	01:17	02:45	00:58	01:13	01:32
N 58°	-	01:55	03:04	01:01	01:19	01:40
56°	-	02:20	03:19	01:05	01:25	01:48
54°	01:10	02:40	03:32	01:08	01:30	01:54
52°	01:45	02:57	03:44	01:10	01:34	02:00
50°	02:09	03:11	03:54	01:13	01:38	02:06
45°	02:50	03:38	04:15	01:18	01:47	02:18
N 40°	03:19	04:00	04:32	01:23	01:54	02:27
35°	03:41	04:17	04:46	01:27	02:00	02:36
30°	03:59	04:32	04:59	01:30	02:06	02:43
20°	04:27	04:55	05:20	01:36	02:16	02:56
N 10°	04:48	05:15	05:38	01:41	02:24	03:07
0°	05:06	05:32	05:55	01:46	02:32	03:18
S 10°	05:22	05:49	06:11	01:51	02:40	03:29
20°	05:38	06:05	06:29	01:57	02:49	03:40
30°	05:53	06:23	06:49	02:03	02:59	03:54
35°	06:02	06:33	07:01	02:07	03:05	04:01
40°	06:10	06:44	07:14	02:11	03:11	04:10
45°	06:20	06:57	07:30	02:16	03:19	04:20
S 50°	06:31	07:12	07:50	02:21	03:28	04:33
52°	06:36	07:19	07:59	02:24	03:32	04:39
54°	06:41	07:27	08:10	02:27	03:37	04:45
56°	06:47	07:35	08:21	02:30	03:42	04:52
58°	06:53	07:45	08:35	02:34	03:48	05:00
S 60°	07:00	07:56	08:51	02:38	03:55	05:10
S 62°	07:08	08:08	09:11	02:43	04:03	05:20

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 3	Moonset 4	Moonset 5
N 72°	-	-	-	16:12	18:03	20:04
N 70°	-	-	-	15:57	17:37	19:19
68°	-	-	-	15:46	17:18	18:49
66°	23:03	-	-	15:36	17:03	18:28
64°	22:08	-	-	15:28	16:50	18:10
62°	21:36	-	-	15:21	16:40	17:56
60°	21:13	22:42	-	15:15	16:31	17:44
N 58°	20:54	22:04	-	15:10	16:23	17:34
56°	20:38	21:38	-	15:05	16:16	17:25
54°	20:25	21:17	22:49	15:01	16:10	17:17
52°	20:14	21:01	22:13	14:57	16:04	17:09
50°	20:03	20:47	21:49	14:54	15:59	17:03
45°	19:42	20:19	21:07	14:46	15:49	16:49
N 40°	19:25	19:57	20:38	14:40	15:40	16:38
35°	19:10	19:40	20:16	14:35	15:32	16:28
30°	18:58	19:25	19:58	14:30	15:25	16:20
20°	18:37	19:01	19:30	14:22	15:14	16:05
N 10°	18:19	18:42	19:09	14:15	15:04	15:53
0°	18:02	18:24	18:50	14:08	14:54	15:41
S 10°	17:45	18:08	18:34	14:02	14:45	15:29
20°	17:28	17:51	18:19	13:55	14:35	15:16
30°	17:07	17:33	18:03	13:47	14:23	15:02
35°	16:55	17:23	17:55	13:42	14:17	14:53
40°	16:42	17:12	17:46	13:37	14:09	14:44
45°	16:26	16:59	17:36	13:31	14:01	14:33
S 50°	16:06	16:44	17:25	13:24	13:50	14:19
52°	15:57	16:37	17:20	13:20	13:45	14:13
54°	15:47	16:30	17:15	13:17	13:40	14:06
56°	15:35	16:21	17:09	13:13	13:34	13:59
58°	15:21	16:12	17:03	13:08	13:28	13:50
S 60°	15:05	16:01	16:56	13:03	13:20	13:40
S 62°	14:46	15:48	16:49	12:58	13:12	13:29

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
3	1 56	1 51	11:58	07:57	20:20	24d 23%
4	1 46	1 41	11:58	08:43	21:06	25d 15%
5	1 35	1 30	11:59	09:29	21:53	26d 9%

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2013 June 6, 7, 8 (Thur, Fri, Saw)

GMT	ARIES	VENUS -3.9		MARS +1.4		JUPITER -1.9		SATURN +0.3	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
6 Thursday 00	254° 34'.3	160° 40'.1	24° 25'.0 N	192° 38'.1	21° 03'.6 N	169° 34'.4	23° 06'.3 N	40° 21'.2	10° 56'.3 S
01	269° 36'.7	175° 39'.2	25'.0	207° 38'.7	04'.0	184° 36'.3	06'.4	55° 23'.8	56'.3
02	284° 39'.2	190° 38'.3	25'.0	222° 39'.3	04'.3	199° 38'.1	06'.4	70° 26'.4	56'.3
03	299° 41'.7	205° 37'.4	25'.0	237° 39'.9	04'.7	214° 39'.9	06'.4	85° 28'.9	56'.2
04	314° 44'.1	220° 36'.5	25'.0	252° 40'.5	05'.0	229° 41'.8	06'.4	100° 31'.5	56'.2
05	329° 46'.6	235° 35'.6	25'.0	267° 41'.1	05'.4	244° 43'.6	06'.4	115° 34'.1	56'.2
06	344° 49'.1	250° 34'.7	25'.0	282° 41'.7	05'.7	259° 45'.5	06'.5	130° 36'.7	56'.1
07	359° 51'.5	265° 33'.8	25'.0	297° 42'.3	06'.1	274° 47'.3	06'.5	145° 39'.3	56'.1
08	14° 54'.0	280° 33'.0	25'.0	312° 42'.9	06'.5	289° 49'.2	06'.5	160° 41'.9	56'.1
09	29° 56'.4	295° 32'.1	25'.0	327° 43'.5	06'.8	304° 51'.0	06'.5	175° 44'.4	56'.0
10	44° 58'.9	310° 31'.2	25'.0	342° 44'.1	07'.2	319° 52'.9	06'.6	190° 47'.0	56'.0
11	60° 01'.4	325° 30'.3	25'.0	357° 44'.7	07'.5	334° 54'.7	06'.6	205° 49'.6	56'.0
12	75° 03'.8	340° 29'.4	24° 25'.0 N	12° 45'.3	21° 07'.9 N	349° 56'.5	23° 06'.6 N	220° 52'.2	10° 56'.0 S
13	90° 06'.3	355° 28'.5	24'.9	27° 45'.9	08'.2	4° 58'.4	06'.6	235° 54'.8	55'.9
14	105° 08'.8	10° 27'.6	24'.9	42° 46'.5	08'.6	20° 00'.2	06'.7	250° 57'.4	55'.9
15	120° 11'.2	25° 26'.7	24'.9	57° 47'.1	08'.9	35° 02'.1	06'.7	265° 59'.9	55'.9
16	135° 13'.7	40° 25'.8	24'.9	72° 47'.7	09'.3	50° 03'.9	06'.7	281° 02'.5	55'.8
17	150° 16'.2	55° 24'.9	24'.9	87° 48'.3	09'.6	65° 05'.8	06'.7	296° 05'.1	55'.8
18	165° 18'.6	70° 24'.1	24'.9	102° 48'.9	10'.0	80° 07'.6	06'.8	311° 07'.7	55'.8
19	180° 21'.1	85° 23'.2	24'.8	117° 49'.5	10'.3	95° 09'.4	06'.8	326° 10'.3	55'.7
20	195° 23'.5	100° 22'.3	24'.8	132° 50'.1	10'.7	110° 11'.3	06'.8	341° 12'.9	55'.7
21	210° 26'.0	115° 21'.4	24'.8	147° 50'.7	11'.0	125° 13'.1	06'.8	356° 15'.4	55'.7
22	225° 28'.5	130° 20'.5	24'.8	162° 51'.3	11'.4	140° 15'.0	06'.8	11° 18'.0	55'.6
23	240° 30'.9	145° 19'.6	24'.7	177° 51'.9	11'.7	155° 16'.8	06'.9	26° 20'.6	55'.6
7 Friday 00	255° 33'.4	160° 18'.7	24° 24'.7 N	192° 52'.5	21° 12'.1 N	170° 18'.7	23° 06'.9 N	41° 23'.2	10° 55'.6 S
01	270° 35'.9	175° 17'.8	24'.7	207° 53'.1	12'.4	185° 20'.5	06'.9	56° 25'.8	55'.5
02	285° 38'.3	190° 16'.9	24'.6	222° 53'.7	12'.8	200° 22'.4	06'.9	71° 28'.3	55'.5
03	300° 40'.8	205° 16'.0	24'.6	237° 54'.3	13'.1	215° 24'.2	07'.0	86° 30'.9	55'.5
04	315° 43'.3	220° 15'.2	24'.6	252° 54'.9	13'.5	230° 26'.0	07'.0	101° 33'.5	55'.5
05	330° 45'.7	235° 14'.3	24'.5	267° 55'.5	13'.8	245° 27'.9	07'.0	116° 36'.1	55'.4
06	345° 48'.2	250° 13'.4	24'.5	282° 56'.1	14'.2	260° 29'.7	07'.0	131° 38'.7	55'.4
07	0° 50'.7	265° 12'.5	24'.5	297° 56'.7	14'.5	275° 31'.6	07'.1	146° 41'.3	55'.4
08	15° 53'.1	280° 11'.6	24'.4	312° 57'.3	14'.9	290° 33'.4	07'.1	161° 43'.8	55'.3
09	30° 55'.6	295° 10'.7	24'.4	327° 57'.9	15'.2	305° 35'.3	07'.1	176° 46'.4	55'.3
10	45° 58'.0	310° 09'.8	24'.4	342° 58'.5	15'.6	320° 37'.1	07'.1	191° 49'.0	55'.3
11	61° 00'.5	325° 08'.9	24'.3	357° 59'.1	15'.9	335° 38'.9	07'.1	206° 51'.6	55'.2
12	76° 03'.0	340° 08'.0	24° 24'.3 N	12° 59'.7	21° 16'.3 N	350° 40'.8	23° 07'.2 N	221° 54'.2	10° 55'.2 S
13	91° 05'.4	355° 07'.1	24'.2	28° 00'.3	16'.6	5° 42'.6	07'.2	236° 56'.7	55'.2
14	106° 07'.9	10° 06'.3	24'.2	43° 00'.9	17'.0	20° 44'.5	07'.2	251° 59'.3	55'.1
15	121° 10'.4	25° 05'.4	24'.1	58° 01'.5	17'.3	35° 46'.3	07'.2	267° 01'.9	55'.1
16	136° 12'.8	40° 04'.5	24'.1	73° 02'.1	17'.6	50° 48'.2	07'.3	282° 04'.5	55'.1
17	151° 15'.3	55° 03'.6	24'.0	88° 02'.7	18'.0	65° 50'.0	07'.3	297° 07'.1	55'.1
18	166° 17'.8	70° 02'.7	24'.0	103° 03'.3	18'.3	80° 51'.8	07'.3	312° 09'.6	55'.0
19	181° 20'.2	85° 01'.8	23'.9	118° 03'.9	18'.7	95° 53'.7	07'.3	327° 12'.2	55'.0
20	196° 22'.7	100° 00'.9	23'.9	133° 04'.5	19'.0	110° 55'.5	07'.3	342° 14'.8	55'.0
21	211° 25'.2	115° 00'.0	23'.8	148° 05'.1	19'.4	125° 57'.4	07'.4	357° 17'.4	54'.9
22	226° 27'.6	129° 59'.1	23'.8	163° 05'.7	19'.7	140° 59'.2	07'.4	12° 19'.9	54'.9
23	241° 30'.1	144° 58'.3	23'.7	178° 06'.3	20'.0	156° 01'.1	07'.4	27° 22'.5	54'.9
8 Saturday 00	256° 32'.5	159° 57'.4	24° 23'.7 N	193° 06'.9	21° 20'.4 N	171° 02'.9	23° 07'.4 N	42° 25'.1	10° 54'.8 S
01	271° 35'.0	174° 56'.5	23'.6	208° 07'.5	20'.7	186° 04'.7	07'.5	57° 27'.7	54'.8
02	286° 37'.5	189° 55'.6	23'.5	223° 08'.1	21'.1	201° 06'.6	07'.5	72° 30'.3	54'.8
03	301° 39'.9	204° 54'.7	23'.5	238° 08'.7	21'.4	216° 08'.4	07'.5	87° 32'.8	54'.8
04	316° 42'.4	219° 53'.8	23'.4	253° 09'.3	21'.8	231° 10'.3	07'.5	102° 35'.4	54'.7
05	331° 44'.9	234° 52'.9	23'.4	268° 09'.9	22'.1	246° 12'.1	07'.5	117° 38'.0	54'.7
06	346° 47'.3	249° 52'.0	23'.3	283° 10'.5	22'.4	261° 14'.0	07'.6	132° 40'.6	54'.7
07	1° 49'.8	264° 51'.2	23'.2	298° 11'.1	22'.8	276° 15'.8	07'.6	147° 43'.1	54'.6
08	16° 52'.3	279° 50'.3	23'.2	313° 11'.7	23'.1	291° 17'.6	07'.6	162° 45'.7	54'.6
09	31° 54'.7	294° 49'.4	23'.1	328° 12'.3	23'.4	306° 19'.5	07'.6	177° 48'.3	54'.6
10	46° 57'.2	309° 48'.5	23'.0	343° 12'.9	23'.8	321° 21'.3	07'.6	192° 50'.9	54'.6
11	61° 59'.7	324° 47'.6	22'.9	358° 13'.5	24'.1	336° 23'.2	07'.7	207° 53'.5	54'.5
12	77° 02'.1	339° 46'.7	24° 22'.9 N	13° 14'.1	21° 24'.5 N	351° 25'.0	23° 07'.7 N	222° 56'.0	10° 54'.5 S
13	92° 04'.6	354° 45'.8	22'.8	28° 14'.7	24'.8	6° 26'.9	07'.7	237° 58'.6	54'.5
14	107° 07'.0	9° 44'.9	22'.7	43° 15'.3	25'.1	21° 28'.7	07'.7	253° 01'.2	54'.4
15	122° 09'.5	24° 44'.1	22'.6	58° 15'.9	25'.5	36° 30'.5	07'.8	268° 03'.8	54'.4
16	137° 12'.0	39° 43'.2	22'.6	73° 16'.5	25'.8	51° 32'.4	07'.8	283° 06'.3	54'.4
17	152° 14'.4	54° 42'.3	22'.5	88° 17'.1	26'.1	66° 34'.2	07'.8	298° 08'.9	54'.3
18	167° 16'.9	69° 41'.4	22'.4	103° 17'.7	26'.5	81° 36'.1	07'.8	313° 11'.5	54'.3
19	182° 19'.4	84° 40'.5	22'.3	118° 18'.3	26'.8	96° 37'.9	07'.8	328° 14'.1	54'.3
20	197° 21'.8	99° 39'.6	22'.2	133° 18'.9	27'.1	111° 39'.8	07'.9	343° 16'.6	54'.3
21	212° 24'.3	114° 38'.7	22'.2	148° 19'.5	27'.5	126° 41'.6	07'.9	358° 19'.2	54'.2
22	227° 26'.8	129° 37'.9	22'.1	163° 20'.1	27'.8	141° 43'.4	07'.9	13° 21'.8	54'.2
23	242° 29'.2	144° 37'.0	22'.0	178° 20'.7	28'.1	156° 45'.3	07'.9	28° 24'.4	54'.2
	M.P. 06:53	v -0'.9	d 0'.0	v 0'.6	d 0'.3	v 1'.8	d 0'.0	v 2'.6	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.7	40° 15'.0 S
Achernar	335° 27'.2	57° 09'.9 S
Acrux	173° 09'.0	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.5	55° 53'.4 N
Alkaid	152° 58'.6	49° 15'.0 N
Alnair	27° 43'.7	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.2	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.6	29° 09'.8 N
Altair	62° 08'.0	8° 54'.4 N
Ankaa	353° 15'.9	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.1	69° 03'.0 S
Avior	234° 18'.4	59° 33'.6 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.4 S
Capella	280° 34'.9	46° 00'.5 N
Deneb	49° 31'.2	45° 19'.7 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.1	17° 54'.7 S
Dubhe	193° 51'.8	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.3 N
Enif	33° 47'.0	9° 56'.3 N
Fomalhaut	15° 24'.0	29° 32'.8 S
Gacrux	172° 00'.6	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.5 S
Hamal	328° 01'.0	23° 31'.4 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 19'.1	74° 06'.2 N
Markab	13° 38'.3	15° 16'.7 N
Menkar	314° 15'.3	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.1	69° 46'.8 S
Mirfak	308° 40'.8	49° 54'.3 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.9	56° 41'.1 S
Polaris	318° 09'.0	89° 19'.1 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.4 S
Rigil Kent	139° 51'.1	60° 53'.5 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.7	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.6 S
Sirius	258° 34'.1	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.6 S
Vega	80° 38'.6	38° 47'.8 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	264° 45'.3	13:20
Mars	297° 19'.1	11:08
Jupiter	274° 45'.3	12:37
Saturn	145° 49'.8	21:11

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 21'.1	22° 38'.6 N	210° 47'.7	12'.5	16° 44'.5 N	5'.9	54'.6
195° 21'.0	38'.8	225° 19'.2	12'.4	50'.4	5'.9	
210° 20'.8	39'.1	239° 50'.6	12'.5	56'.3	5'.8	
225° 20'.7	39'.3	254° 22'.1	12'.5	17° 02'.1 N	5'.7	
240° 20'.6	39'.6	268° 53'.6	12'.4	07'.8	5'.7	
255° 20'.5	39'.9	283° 25'.0	12'.4	13'.5	5'.6	
270° 20'.4	40'.1	297° 56'.4	12'.4	19'.1	5'.4	54'.5
285° 20'.3	40'.4	312° 27'.8	12'.4	24'.5	5'.4	
300° 20'.2	40'.6	326° 59'.2	12'.3	29'.9	5'.3	
315° 20'.0	40'.9	341° 30'.5	12'.4	35'.2	5'.3	
330° 19'.9	41'.1	356° 01'.9	12'.3	40'.5	5'.1	
345° 19'.8	41'.4	10° 33'.2	12'.3	45'.6	5'.1	
0° 19'.7	22° 41'.6 N	25° 04'.5	12'.3	17° 50'.7 N	5'.0	54'.5
15° 19'.6	41'.9	39° 35'.8	12'.2	55'.7	4'.9	54'.4
30° 19'.5	42'.1	54° 07'.0	12'.3	18° 00'.6 N	4'.8	
45° 19'.3	42'.4	68° 38'.3	12'.2	05'.4	4'.7	
60° 19'.2	42'.6	83° 09'.5	12'.3	10'.1	4'.7	
75° 19'.1	42'.9	97° 40'.8	12'.2	14'.8	4'.5	
90° 19'.0	43'.1	112° 12'.0	12'.2	19'.3	4'.5	
105° 18'.9	43'.4	126° 43'.2	12'.1	23'.8	4'.4	
120° 18'.8	43'.6	141° 14'.3	12'.2	28'.2	4'.3	
135° 18'.6	43'.9	155° 45'.5	12'.1	32'.5	4'.2	
150° 18'.5	44'.1	170° 16'.6	12'.2	36'.7	4'.1	54'.3
165° 18'.4	44'.3	184° 47'.8	12'.1	40'.8	4'.0	
180° 18'.3	22° 44'.6 N	199° 18'.9	12'.1	18° 44'.8 N	4'.0	54'.3
195° 18'.2	44'.8	213° 50'.0	12'.1	48'.8	3'.8	
210° 18'.1	45'.1	228° 21'.1	12'.1	52'.6	3'.8	
225° 17'.9	45'.3	242° 52'.2	12'.0	56'.4	3'.7	
240° 17'.8	45'.5	257° 23'.2	12'.1	19° 00'.1 N	3'.6	
255° 17'.7	45'.8	271° 54'.3	12'.0	03'.7	3'.5	
270° 17'.6	46'.0	286° 25'.3	12'.0	07'.2	3'.4	
285° 17'.5	46'.3	300° 56'.3	12'.1	10'.6	3'.3	54'.2
300° 17'.4	46'.5	315° 27'.4	12'.0	13'.9	3'.2	
315° 17'.2	46'.7	329° 58'.4	12'.0	17'.1	3'.2	
330° 17'.1	47'.0	344° 29'.4	11'.9	20'.3	3'.0	
345° 17'.0	47'.2	359° 00'.3	12'.0	23'.3	3'.0	
0° 16'.9	22° 47'.4 N	13° 31'.3	12'.0	19° 26'.3 N	2'.8	54'.2
15° 16'.8	47'.7	28° 02'.3	11'.9	29'.1	2'.8	
30° 16'.6	47'.9	42° 33'.2	12'.0	31'.9	2'.7	
45° 16'.5	48'.1	57° 04'.2	11'.9	34'.6	2'.6	
60° 16'.4	48'.4	71° 35'.1	11'.9	37'.2	2'.5	
75° 16'.3	48'.6	86° 06'.0	12'.0	39'.7	2'.4	
90° 16'.2	48'.8	100° 37'.0	11'.9	42'.1	2'.3	
105° 16'.0	49'.1	115° 07'.9	11'.9	44'.4	2'.2	54'.1
120° 15'.9	49'.3	129° 38'.8	11'.9	46'.6	2'.2	
135° 15'.8	49'.5	144° 09'.7	11'.9	48'.8	2'.0	
150° 15'.7	49'.7	158° 40'.6	11'.9	50'.8	2'.0	
165° 15'.6	50'.0	173° 11'.5	11'.8	52'.8	1'.8	
180° 15'.4	22° 50'.2 N	187° 42'.3	11'.9	19° 54'.6 N	1'.8	54'.1
195° 15'.3	50'.4	202° 13'.2	11'.9	56'.4	1'.6	
210° 15'.2	50'.6	216° 44'.1	11'.9	58'.0	1'.6	
225° 15'.1	50'.9	231° 15'.0	11'.8	59'.6	1'.5	
240° 15'.0	51'.1	245° 45'.8	11'.9	20° 01'.1 N	1'.4	
255° 14'.8	51'.3	260° 16'.7	11'.9	02'.5	1'.3	
270° 14'.7	51'.5	274° 47'.6	11'.8	03'.8	1'.2	
285° 14'.6	51'.8	289° 18'.4	11'.9	05'.0	1'.1	
300° 14'.5	52'.0	303° 49'.3	11'.9	06'.1	1'.0	
315° 14'.4	52'.2	318° 20'.2	11'.8	07'.1	0'.9	54'.0
330° 14'.2	52'.4	332° 51'.0	11'.9	08'.0	0'.8	
345° 14'.1	52'.6	347° 21'.9	11'.9	08'.8	0'.7	
0° 14'.0	22° 52'.9 N	1° 52'.8	11'.8	20° 09'.5 N	0'.7	54'.0
15° 13'.9	53'.1	16° 23'.6	11'.9	10'.2	0'.5	
30° 13'.7	53'.3	30° 54'.5	11'.9	10'.7	0'.5	
45° 13'.6	53'.5	45° 25'.4	11'.8	11'.2	0'.3	
60° 13'.5	53'.7	59° 56'.2	11'.9	11'.5	0'.3	
75° 13'.4	53'.9	74° 27'.1	11'.9	11'.8	0'.1	
90° 13'.3	54'.1	88° 58'.0	11'.9	11'.9	0'.1	
105° 13'.1	54'.4	103° 28'.9	11'.9	12'.0	0'.0	
120° 13'.0	54'.6	117° 59'.8	11'.9	12'.0	0'.1	
135° 12'.9	54'.8	132° 30'.7	11'.9	11'.9	0'.2	
150° 12'.8	55'.0	147° 01'.6	11'.9	11'.7	0'.3	
165° 12'.6	55'.2	161° 32'.5	11'.9	11'.4	0'.4	
SD 15'.8	d 0'.2	SD 14'.8		14'.8	14'.7	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8
N 72°	-	-	-	-	-	-
N 70°	-	-	-	00:16	00:10	00:01
68°	-	-	-	00:46	00:57	01:18
66°	-	-	00:44	01:09	01:27	01:56
64°	-	-	01:44	01:27	01:50	02:22
62°	-	-	02:18	01:42	02:08	02:43
60°	-	01:09	02:42	01:54	02:23	03:00
N 58°	-	01:50	03:01	02:05	02:36	03:14
56°	-	02:17	03:17	02:14	02:47	03:26
54°	01:03	02:37	03:30	02:23	02:56	03:37
52°	01:41	02:54	03:42	02:30	03:05	03:46
50°	02:06	03:09	03:52	02:37	03:13	03:54
45°	02:48	03:37	04:14	02:52	03:30	04:12
N 40°	03:18	03:59	04:31	03:04	03:43	04:27
35°	03:40	04:16	04:46	03:14	03:55	04:40
30°	03:58	04:31	04:58	03:23	04:05	04:50
20°	04:26	04:55	05:20	03:38	04:23	05:09
N 10°	04:48	05:15	05:38	03:52	04:38	05:25
0°	05:07	05:33	05:55	04:05	04:53	05:41
S 10°	05:23	05:49	06:12	04:18	05:07	05:56
20°	05:39	06:06	06:30	04:32	05:22	06:12
30°	05:55	06:24	06:51	04:48	05:40	06:31
35°	06:03	06:35	07:03	04:57	05:51	06:42
40°	06:12	06:46	07:16	05:07	06:03	06:55
45°	06:22	06:59	07:33	05:20	06:17	07:09
S 50°	06:33	07:14	07:52	05:35	06:34	07:28
52°	06:38	07:22	08:02	05:42	06:42	07:36
54°	06:44	07:29	08:13	05:50	06:51	07:46
56°	06:49	07:38	08:25	05:59	07:01	07:57
58°	06:56	07:48	08:39	06:09	07:13	08:09
S 60°	07:03	07:59	08:55	06:21	07:26	08:24
S 62°	07:11	08:12	09:15	06:35	07:43	08:41

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 6	Moonset 7	Moonset 8
N 72°	-	-	-	-	-	-
N 70°	-	-	-	21:03	22:52	-
68°	-	-	-	20:17	21:35	22:33
66°	23:19	-	-	19:47	20:58	21:53
64°	22:15	-	-	19:25	20:31	21:25
62°	21:41	-	-	19:07	20:11	21:04
60°	21:17	22:51	-	18:53	19:54	20:47
N 58°	20:58	22:09	-	18:40	19:40	20:32
56°	20:42	21:42	-	18:29	19:28	20:20
54°	20:28	21:21	22:57	18:20	19:18	20:09
52°	20:16	21:04	22:18	18:11	19:08	20:00
50°	20:06	20:50	21:53	18:04	19:00	19:51
45°	19:44	20:21	21:10	17:47	18:42	19:33
N 40°	19:27	19:59	20:40	17:34	18:28	19:18
35°	19:12	19:42	20:18	17:23	18:16	19:05
30°	18:59	19:27	20:00	17:13	18:05	18:55
20°	18:38	19:02	19:32	16:56	17:47	18:36
N 10°	18:20	18:43	19:10	16:42	17:31	18:19
0°	18:03	18:25	18:51	16:28	17:16	18:04
S 10°	17:46	18:08	18:35	16:14	17:01	17:49
20°	17:28	17:51	18:19	15:59	16:45	17:32
30°	17:07	17:33	18:03	15:43	16:27	17:13
35°	16:55	17:23	17:55	15:33	16:16	17:02
40°	16:41	17:12	17:46	15:22	16:04	16:49
45°	16:25	16:59	17:36	15:09	15:49	16:34
S 50°	16:05	16:43	17:24	14:53	15:32	16:16
52°	15:56	16:36	17:19	14:46	15:23	16:07
54°	15:45	16:28	17:14	14:37	15:14	15:58
56°	15:33	16:19	17:08	14:28	15:04	15:47
58°	15:19	16:10	17:02	14:18	14:52	15:34
S 60°	15:02	15:59	16:55	14:06	14:38	15:20
S 62°	14:42	15:46	16:47	13:52	14:22	15:02

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
6	1 25	1 19	11:59	10:16	22:40	27d 4%
7	1 13	1 08	11:59	11:04	23:28	28d 1%
8	1 02	0 56	11:59	11:52	24:16	29d 0%

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2013 June 9, 10, 11 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.4		JUPITER -1.9		SATURN +0.3	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
9 Sunday 00	257° 31'.7	159° 36'.1	24° 21'.9 N	193° 21'.3	21° 28'.5 N	171° 47'.1	23° 07'.9 N	43° 26'.9	10° 54'.1 S
01	272° 34'.2	174° 35'.2	21'.8	208° 21'.9	28'.8	186° 49'.0	08'.0	58° 29'.5	54'.1
02	287° 36'.6	189° 34'.3	21'.7	223° 22'.5	29'.1	201° 50'.8	08'.0	73° 32'.1	54'.1
03	302° 39'.1	204° 33'.4	21'.6	238° 23'.1	29'.5	216° 52'.7	08'.0	88° 34'.7	54'.1
04	317° 41'.5	219° 32'.5	21'.5	253° 23'.7	29'.8	231° 54'.5	08'.0	103° 37'.2	54'.0
05	332° 44'.0	234° 31'.7	21'.4	268° 24'.3	30'.1	246° 56'.3	08'.1	118° 39'.8	54'.0
06	347° 46'.5	249° 30'.8	21'.3	283° 24'.9	30'.5	261° 58'.2	08'.1	133° 42'.4	54'.0
07	2° 48'.9	264° 29'.9	21'.3	298° 25'.5	30'.8	277° 00'.0	08'.1	148° 45'.0	53'.9
08	17° 51'.4	279° 29'.0	21'.2	313° 26'.1	31'.1	292° 01'.9	08'.1	163° 47'.5	53'.9
09	32° 53'.9	294° 28'.1	21'.1	328° 26'.7	31'.5	307° 03'.7	08'.1	178° 50'.1	53'.9
10	47° 56'.3	309° 27'.2	21'.0	343° 27'.3	31'.8	322° 05'.6	08'.2	193° 52'.7	53'.9
11	62° 58'.8	324° 26'.3	20'.9	358° 27'.9	32'.1	337° 07'.4	08'.2	208° 55'.3	53'.8
12	78° 01'.3	339° 25'.5	24° 20'.7 N	13° 28'.5	21° 32'.4 N	352° 09'.2	23° 08'.2 N	223° 57'.8	10° 53'.8 S
13	93° 03'.7	354° 24'.6	20'.6	28° 29'.1	32'.8	7° 11'.1	08'.2	239° 00'.4	53'.8
14	108° 06'.2	9° 23'.7	20'.5	43° 29'.7	33'.1	22° 12'.9	08'.2	254° 03'.0	53'.8
15	123° 08'.6	24° 22'.8	20'.4	58° 30'.3	33'.4	37° 14'.8	08'.3	269° 05'.6	53'.7
16	138° 11'.1	39° 21'.9	20'.3	73° 30'.9	33'.7	52° 16'.6	08'.3	284° 08'.1	53'.7
17	153° 13'.6	54° 21'.0	20'.2	88° 31'.5	34'.1	67° 18'.4	08'.3	299° 10'.7	53'.7
18	168° 16'.0	69° 20'.2	20'.1	103° 32'.1	34'.4	82° 20'.3	08'.3	314° 13'.3	53'.6
19	183° 18'.5	84° 19'.3	20'.0	118° 32'.7	34'.7	97° 22'.1	08'.3	329° 15'.9	53'.6
20	198° 21'.0	99° 18'.4	19'.9	133° 33'.3	35'.1	112° 24'.0	08'.4	344° 18'.4	53'.6
21	213° 23'.4	114° 17'.5	19'.8	148° 33'.9	35'.4	127° 25'.8	08'.4	359° 21'.0	53'.6
22	228° 25'.9	129° 16'.6	19'.7	163° 34'.4	35'.7	142° 27'.7	08'.4	14° 23'.6	53'.5
23	243° 28'.4	144° 15'.7	19'.5	178° 35'.0	36'.0	157° 29'.5	08'.4	29° 26'.1	53'.5
10 Monday 00	258° 30'.8	159° 14'.9	24° 19'.4 N	193° 35'.6	21° 36'.4 N	172° 31'.3	23° 08'.4 N	44° 28'.7	10° 53'.5 S
01	273° 33'.3	174° 14'.0	19'.3	208° 36'.2	36'.7	187° 33'.2	08'.5	59° 31'.3	53'.4
02	288° 35'.8	189° 13'.1	19'.2	223° 36'.8	37'.0	202° 35'.0	08'.5	74° 33'.9	53'.4
03	303° 38'.2	204° 12'.2	19'.1	238° 37'.4	37'.3	217° 36'.9	08'.5	89° 36'.4	53'.4
04	318° 40'.7	219° 11'.3	18'.9	253° 38'.0	37'.6	232° 38'.7	08'.5	104° 39'.0	53'.4
05	333° 43'.1	234° 10'.4	18'.8	268° 38'.6	38'.0	247° 40'.5	08'.5	119° 41'.6	53'.3
06	348° 45'.6	249° 09'.6	18'.7	283° 39'.2	38'.3	262° 42'.4	08'.6	134° 44'.1	53'.3
07	3° 48'.1	264° 08'.7	18'.6	298° 39'.8	38'.6	277° 44'.2	08'.6	149° 46'.7	53'.3
08	18° 50'.5	279° 07'.8	18'.4	313° 40'.4	38'.9	292° 46'.1	08'.6	164° 49'.3	53'.3
09	33° 53'.0	294° 06'.9	18'.3	328° 41'.0	39'.3	307° 47'.9	08'.6	179° 51'.9	53'.2
10	48° 55'.5	309° 06'.0	18'.2	343° 41'.6	39'.6	322° 49'.8	08'.6	194° 54'.4	53'.2
11	63° 57'.9	324° 05'.2	18'.0	358° 42'.2	39'.9	337° 51'.6	08'.7	209° 57'.0	53'.2
12	79° 00'.4	339° 04'.3	24° 17'.9 N	13° 42'.8	21° 40'.2 N	352° 53'.4	23° 08'.7 N	224° 59'.6	10° 53'.1 S
13	94° 02'.9	354° 03'.4	17'.8	28° 43'.4	40'.5	7° 55'.3	08'.7	240° 02'.1	53'.1
14	109° 05'.3	9° 02'.5	17'.6	43° 44'.0	40'.9	22° 57'.1	08'.7	255° 04'.7	53'.1
15	124° 07'.8	24° 01'.6	17'.5	58° 44'.6	41'.2	37° 59'.0	08'.7	270° 07'.3	53'.1
16	139° 10'.3	39° 00'.8	17'.4	73° 45'.2	41'.5	53° 00'.8	08'.8	285° 09'.8	53'.0
17	154° 12'.7	53° 59'.9	17'.2	88° 45'.8	41'.8	68° 02'.6	08'.8	300° 12'.4	53'.0
18	169° 15'.2	68° 59'.0	17'.1	103° 46'.4	42'.1	83° 04'.5	08'.8	315° 15'.0	53'.0
19	184° 17'.6	83° 58'.1	17'.0	118° 47'.0	42'.4	98° 06'.3	08'.8	330° 17'.6	53'.0
20	199° 20'.1	98° 57'.2	16'.8	133° 47'.6	42'.8	113° 08'.2	08'.8	345° 20'.1	52'.9
21	214° 22'.6	113° 56'.4	16'.7	148° 48'.2	43'.1	128° 10'.0	08'.9	0° 22'.7	52'.9
22	229° 25'.0	128° 55'.5	16'.5	163° 48'.8	43'.4	143° 11'.9	08'.9	15° 25'.3	52'.9
23	244° 27'.5	143° 54'.6	16'.4	178° 49'.4	43'.7	158° 13'.7	08'.9	30° 27'.8	52'.9
11 Tuesday 00	259° 30'.0	158° 53'.7	24° 16'.2 N	193° 50'.0	21° 44'.0 N	173° 15'.5	23° 08'.9 N	45° 30'.4	10° 52'.8 S
01	274° 32'.4	173° 52'.8	16'.1	208° 50'.6	44'.3	188° 17'.4	08'.9	60° 33'.0	52'.8
02	289° 34'.9	188° 52'.0	15'.9	223° 51'.1	44'.7	203° 19'.2	08'.9	75° 35'.5	52'.8
03	304° 37'.4	203° 51'.1	15'.8	238° 51'.7	45'.0	218° 21'.1	09'.0	90° 38'.1	52'.8
04	319° 39'.8	218° 50'.2	15'.6	253° 52'.3	45'.3	233° 22'.9	09'.0	105° 40'.7	52'.7
05	334° 42'.3	233° 49'.3	15'.5	268° 52'.9	45'.6	248° 24'.7	09'.0	120° 43'.2	52'.7
06	349° 44'.8	248° 48'.5	15'.3	283° 53'.5	45'.9	263° 26'.6	09'.0	135° 45'.8	52'.7
07	4° 47'.2	263° 47'.6	15'.2	298° 54'.1	46'.2	278° 28'.4	09'.0	150° 48'.4	52'.6
08	19° 49'.7	278° 46'.7	15'.0	313° 54'.7	46'.5	293° 30'.3	09'.1	165° 50'.9	52'.6
09	34° 52'.1	293° 45'.8	14'.8	328° 55'.3	46'.8	308° 32'.1	09'.1	180° 53'.5	52'.6
10	49° 54'.6	308° 44'.9	14'.7	343° 55'.9	47'.2	323° 34'.0	09'.1	195° 56'.1	52'.6
11	64° 57'.1	323° 44'.1	14'.5	358° 56'.5	47'.5	338° 35'.8	09'.1	210° 58'.7	52'.5
12	79° 59'.5	338° 43'.2	24° 14'.4 N	13° 57'.1	21° 47'.8 N	353° 37'.6	23° 09'.1 N	226° 01'.2	10° 52'.5 S
13	95° 02'.0	353° 42'.3	14'.2	28° 57'.7	48'.1	8° 39'.5	09'.2	241° 03'.8	52'.5
14	110° 04'.5	8° 41'.4	14'.0	43° 58'.3	48'.4	23° 41'.3	09'.2	256° 06'.4	52'.5
15	125° 06'.9	23° 40'.6	13'.9	58° 58'.9	48'.7	38° 43'.2	09'.2	271° 08'.9	52'.4
16	140° 09'.4	38° 39'.7	13'.7	73° 59'.5	49'.0	53° 45'.0	09'.2	286° 11'.5	52'.4
17	155° 11'.9	53° 38'.8	13'.5	89° 00'.1	49'.3	68° 46'.8	09'.2	301° 14'.1	52'.4
18	170° 14'.3	68° 37'.9	13'.4	104° 00'.7	49'.6	83° 48'.7	09'.2	316° 16'.6	52'.4
19	185° 16'.8	83° 37'.1	13'.2	119° 01'.3	49'.9	98° 50'.5	09'.3	331° 19'.2	52'.3
20	200° 19'.3	98° 36'.2	13'.0	134° 01'.9	50'.3	113° 52'.4	09'.3	346° 21'.7	52'.3
21	215° 21'.7	113° 35'.3	12'.8	149° 02'.5	50'.6	128° 54'.2	09'.3	1° 24'.3	52'.3
22	230° 24'.2	128° 34'.4	12'.7	164° 03'.1	50'.9	143° 56'.0	09'.3	16° 26'.9	52'.3
23	245° 26'.6	143° 33'.6	12'.5	179° 03'.7	51'.2	158° 57'.9	09'.3	31° 29'.4	52'.2
	M.P. 06:41	v -0'.9	d 0'.1	v 0'.6	d 0'.3	v 1'.8	d 0'.0	v 2'.6	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.7	40° 15'.0 S
Achernar	335° 27'.2	57° 09'.9 S
Acrux	173° 09'.0	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.5	55° 53'.4 N
Alkaid	152° 58'.6	49° 15'.0 N
Alnair	27° 43'.6	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.3	8° 43'.3 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.6	29° 09'.8 N
Altair	62° 08'.0	8° 54'.4 N
Ankaa	353° 15'.9	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.1	69° 03'.0 S
Avior	234° 18'.4	59° 33'.5 S
Bellatrix	278° 32'.4	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.4 S
Capella	280° 34'.9	46° 00'.5 N
Deneb	49° 31'.1	45° 19'.7 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.0	17° 54'.7 S
Dubhe	193° 51'.8	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.3 N
Enif	33° 47'.0	9° 56'.3 N
Fomalhaut	15° 24'.0	29° 32'.8 S
Gacrux	172° 00'.6	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.5 S
Hamal	328° 01'.0	23° 31'.4 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 19'.2	74° 06'.2 N
Markab	13° 38'.3	15° 16'.7 N
Menkar	314° 15'.3	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.1	69° 46'.8 S
Mirfak	308° 40'.8	49° 54'.3 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.9	56° 41'.1 S
Polaris	318° 07'.9	89° 19'.1 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.1 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.3 S
Rigil Kent	139° 51'.1	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.7	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.6 S
Vega	80° 38'.5	38° 47'.9 N
Zuben'ubi	137° 05'.1	16° 05'.9 S
	SHA	Mer.Pass.
Venus	260° 44'.0	13:24
Mars	295° 04'.8	11:05
Jupiter	274° 00'.5	12:28
Saturn	145° 57'.9	20:58

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 12'.5	22° 55'.4 N	176° 03'.4	11'.9	20° 11'.0 N	0'.5	54'.0
195° 12'.4	55'.6	190° 34'.3	11'.9	10'.5	0'.6	
210° 12'.3	55'.8	205° 05'.2	12'.0	09'.9	0'.7	
225° 12'.2	56'.0	219° 36'.2	11'.9	09'.2	0'.7	
240° 12'.0	56'.2	234° 07'.1	12'.0	08'.5	0'.9	
255° 11'.9	56'.4	248° 38'.1	11'.9	07'.6	1'.0	
270° 11'.8	56'.6	263° 09'.0	12'.0	06'.6	1'.0	
285° 11'.7	56'.9	277° 40'.0	12'.0	05'.6	1'.2	
300° 11'.5	57'.1	292° 11'.0	12'.0	04'.4	1'.2	
315° 11'.4	57'.3	306° 42'.0	12'.0	03'.2	1'.3	
330° 11'.3	57'.5	321° 13'.0	12'.0	01'.9	1'.4	
345° 11'.2	57'.7	335° 44'.0	12'.0	00'.5	1'.5	
0° 11'.0	22° 57'.9 N	350° 15'.0	12'.1	19° 59'.0 N	1'.6	54'.0
15° 10'.9	58'.1	4° 46'.1	12'.1	57'.4	1'.7	53'.9
30° 10'.8	58'.3	19° 17'.2	12'.0	55'.7	1'.8	
45° 10'.7	58'.5	33° 48'.2	12'.1	53'.9	1'.9	
60° 10'.5	58'.7	48° 19'.3	12'.1	52'.0	2'.0	
75° 10'.4	58'.9	62° 50'.4	12'.1	50'.0	2'.0	
90° 10'.3	59'.1	77° 21'.5	12'.2	48'.0	2'.2	
105° 10'.2	59'.2	91° 52'.7	12'.1	45'.8	2'.2	
120° 10'.0	59'.4	106° 23'.8	12'.2	43'.6	2'.3	
135° 09'.9	59'.6	120° 55'.0	12'.2	41'.3	2'.5	
150° 09'.8	59'.8	135° 26'.2	12'.2	38'.8	2'.5	
165° 09'.7	23° 00'.0 N	149° 57'.4	12'.2	36'.3	2'.6	
180° 09'.5	23° 00'.2 N	164° 28'.6	12'.2	19° 33'.7 N	2'.7	53'.9
195° 09'.4	00'.4	178° 59'.8	12'.3	31'.0	2'.7	
210° 09'.3	00'.6	193° 31'.1	12'.2	28'.3	2'.9	
225° 09'.2	00'.8	208° 02'.3	12'.3	25'.4	3'.0	
240° 09'.0	01'.0	222° 33'.6	12'.3	22'.4	3'.0	
255° 08'.9	01'.2	237° 04'.9	12'.4	19'.4	3'.1	
270° 08'.8	01'.4	251° 36'.3	12'.3	16'.3	3'.2	
285° 08'.7	01'.5	266° 07'.6	12'.4	13'.1	3'.3	54'.0
300° 08'.5	01'.7	280° 39'.0	12'.4	09'.8	3'.4	
315° 08'.4	01'.9	295° 10'.4	12'.4	06'.4	3'.5	
330° 08'.3	02'.1	309° 41'.8	12'.4	02'.9	3'.6	
345° 08'.2	02'.3	324° 13'.2	12'.5	18° 59'.3 N	3'.6	
0° 08'.0	23° 02'.5 N	338° 44'.7	12'.5	18° 55'.7 N	3'.8	54'.0
15° 07'.9	02'.7	353° 16'.2	12'.5	51'.9	3'.8	
30° 07'.8	02'.8	7° 47'.7	12'.5	48'.1	3'.9	
45° 07'.6	03'.0	22° 19'.2	12'.5	44'.2	4'.0	
60° 07'.5	03'.2	36° 50'.7	12'.6	40'.2	4'.1	
75° 07'.4	03'.4	51° 22'.3	12'.6	36'.1	4'.1	
90° 07'.3	03'.6	65° 53'.9	12'.6	32'.0	4'.3	
105° 07'.1	03'.7	80° 25'.5	12'.6	27'.7	4'.3	
120° 07'.0	03'.9	94° 57'.1	12'.7	23'.4	4'.4	
135° 06'.9	04'.1	109° 28'.8	12'.7	19'.0	4'.5	
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165° 06'.6	04'.4	138° 32'.2	12'.7	09'.9	4'.6	
180° 06'.5	23° 04'.6 N	153° 03'.9	12'.8	18° 05'.3 N	4'.8	54'.0
195° 06'.4	04'.8	167° 35'.7	12'.7	00'.5	4'.8	
210° 06'.2	05'.0	182° 07'.4	12'.8	17° 55'.7 N	4'.9	
225° 06'.1	05'.1	196° 39'.2	12'.9	50'.8	5'.0	
240° 06'.0	05'.3	211° 11'.1	12'.8	45'.8	5'.0	
255° 05'.9	05'.5	225° 42'.9	12'.9	40'.8	5'.1	
270° 05'.7	05'.7	240° 14'.8	12'.9	35'.7	5'.3	
285° 05'.6	05'.8	254° 46'.7	12'.9	30'.4	5'.3	
300° 05'.5	06'.0	269° 18'.6	13'.0	25'.1	5'.3	
315° 05'.3	06'.2	283° 50'.6	13'.0	19'.8	5'.5	54'.1
330° 05'.2	06'.3	298° 22'.6	13'.0	14'.3	5'.5	
345° 05'.1	06'.5	312° 54'.6	13'.0	08'.8	5'.6	
0° 05'.0	23° 06'.7 N	327° 26'.6	13'.0	17° 03'.2 N	5'.7	54'.1
15° 04'.8	06'.8	341° 58'.6	13'.1	16° 57'.5 N	5'.7	
30° 04'.7	07'.0	356° 30'.7	13'.1	51'.8	5'.9	
45° 04'.6	07'.2	11° 02'.8	13'.2	45'.9	5'.9	
60° 04'.4	07'.3	25° 35'.0	13'.1	40'.0	6'.0	
75° 04'.3	07'.5	40° 07'.1	13'.2	34'.0	6'.0	
90° 04'.2	07'.7	54° 39'.3	13'.2	28'.0	6'.1	
105° 04'.1	07'.8	69° 11'.5	13'.2	21'.9	6'.2	
120° 03'.9	08'.0	83° 43'.7	13'.3	15'.7	6'.3	
135° 03'.8	08'.1	98° 16'.0	13'.3	09'.4	6'.4	
150° 03'.7	08'.3	112° 48'.3	13'.3	03'.0	6'.4	
165° 03'.5	08'.5	127° 20'.6	13'.3	15° 56'.6 N	6'.5	54'.2
SD 15'.8	d 0'.2	SD	14'.7	14'.7	14'.7	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11
N 72°	-	-	-	-	-	02:27
N 70°	-	-	-	-	02:06	03:50
68°	-	-	-	02:01	03:07	04:29
66°	-	-	00:28	02:40	03:42	04:55
64°	-	-	01:39	03:08	04:07	05:16
62°	-	-	02:14	03:29	04:26	05:32
60°	-	01:02	02:39	03:46	04:42	05:46
N 58°	-	01:46	02:59	04:01	04:56	05:58
56°	-	02:14	03:15	04:13	05:07	06:08
54°	00:57	02:35	03:29	04:24	05:18	06:17
52°	01:37	02:52	03:41	04:33	05:27	06:25
50°	02:03	03:07	03:51	04:42	05:35	06:32
45°	02:47	03:36	04:13	05:00	05:52	06:47
N 40°	03:17	03:58	04:31	05:15	06:06	07:00
35°	03:39	04:16	04:46	05:27	06:18	07:11
30°	03:58	04:31	04:58	05:38	06:28	07:20
20°	04:26	04:55	05:20	05:57	06:46	07:36
N 10°	04:49	05:16	05:39	06:13	07:02	07:50
0°	05:07	05:33	05:56	06:29	07:16	08:03
S 10°	05:24	05:50	06:13	06:44	07:31	08:16
20°	05:40	06:07	06:31	07:00	07:46	08:30
30°	05:56	06:26	06:52	07:19	08:04	08:46
35°	06:04	06:36	07:04	07:30	08:15	08:55
40°	06:14	06:48	07:18	07:43	08:26	09:06
45°	06:24	07:01	07:34	07:57	08:40	09:18
S 50°	06:35	07:16	07:55	08:16	08:57	09:33
52°	06:40	07:24	08:04	08:24	09:05	09:40
54°	06:46	07:32	08:15	08:34	09:14	09:48
56°	06:52	07:41	08:27	08:45	09:24	09:57
58°	06:58	07:51	08:42	08:57	09:36	10:07
S 60°	07:05	08:02	08:59	09:11	09:49	10:18
S 62°	07:14	08:15	09:19	09:29	10:04	10:31

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 9	Moonset 10	Moonset 11
N 72°	-	-	-	-	-	01:24
N 70°	-	-	-	-	00:07	00:01 23:56
68°	-	-	-	23:06	23:22	23:29
66°	23:38	-	-	22:31	22:54	23:09
64°	22:21	-	-	22:05	22:33	22:53
62°	21:46	-	-	21:46	22:16	22:39
60°	21:21	22:59	-	21:29	22:02	22:28
N 58°	21:01	22:14	-	21:16	21:50	22:18
56°	20:45	21:46	-	21:04	21:40	22:09
54°	20:31	21:24	23:04	20:53	21:30	22:01
52°	20:19	21:07	22:23	20:44	21:22	21:54
50°	20:08	20:52	21:56	20:36	21:15	21:48
45°	19:46	20:23	21:12	20:18	20:59	21:35
N 40°	19:28	20:01	20:42	20:04	20:46	21:23
35°	19:14	19:43	20:20	19:52	20:35	21:14
30°	19:01	19:28	20:01	19:41	20:25	21:05
20°	18:39	19:04	19:33	19:23	20:08	20:50
N 10°	18:20	18:43	19:10	19:07	19:53	20:38
0°	18:03	18:26	18:52	18:52	19:39	20:25
S 10°	17:46	18:09	18:35	18:37	19:25	20:13
20°	17:28	17:52	18:19	18:21	19:10	20:00
30°	17:07	17:33	18:03	18:02	18:53	19:45
35°	16:55	17:23	17:54	17:51	18:43	19:37
40°	16:41	17:11	17:45	17:39	18:32	19:27
45°	16:24	16:58	17:35	17:24	18:18	19:15
S 50°	16:04	16:42	17:24	17:06	18:02	19:01
52°	15:54	16:35	17:19	16:58	17:54	18:54
54°	15:44	16:27	17:13	16:48	17:45	18:47
56°	15:31	16:18	17:07	16:38	17:35	18:38
58°	15:17	16:08	17:00	16:25	17:24	18:29
S 60°	15:00	15:57	16:53	16:11	17:11	18:18
S 62°	14:39	15:44	16:45	15:54	16:56	18:06

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
9	0 50	0 44	11:59	12:40	00:16	1d 1%
10	0 38	0 32	11:59	13:28	01:04	2d 3%
11	0 26	0 20	12:00	14:14	01:51	3d 7%

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2013 June 12, 13, 14 (Wed, Thur, Fri)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
12 Wednesday 00	260° 29'.1	158° 32'.7	24° 12'.3 N	194° 04'.3	21° 51'.5 N	173° 59'.7	23° 09'.4 N	46° 32'.0	10° 52'.2 S
01	275° 31'.6	173° 31'.8	12'.1	209° 04'.8	51'.8	189° 01'.6	09'.4	61° 34'.6	52'.2
02	290° 34'.0	188° 30'.9	12'.0	224° 05'.4	52'.1	204° 03'.4	09'.4	76° 37'.1	52'.2
03	305° 36'.5	203° 30'.1	11'.8	239° 06'.0	52'.4	219° 05'.2	09'.4	91° 39'.7	52'.1
04	320° 39'.0	218° 29'.2	11'.6	254° 06'.6	52'.7	234° 07'.1	09'.4	106° 42'.3	52'.1
05	335° 41'.4	233° 28'.3	11'.4	269° 07'.2	53'.0	249° 08'.9	09'.4	121° 44'.8	52'.1
06	350° 43'.9	248° 27'.4	11'.2	284° 07'.8	53'.3	264° 10'.8	09'.5	136° 47'.4	52'.1
07	5° 46'.4	263° 26'.6	11'.0	299° 08'.4	53'.6	279° 12'.6	09'.5	151° 50'.0	52'.0
08	20° 48'.8	278° 25'.7	10'.9	314° 09'.0	53'.9	294° 14'.5	09'.5	166° 52'.5	52'.0
09	35° 51'.3	293° 24'.8	10'.7	329° 09'.6	54'.2	309° 16'.3	09'.5	181° 55'.1	52'.0
10	50° 53'.7	308° 23'.9	10'.5	344° 10'.2	54'.5	324° 18'.1	09'.5	196° 57'.7	52'.0
11	65° 56'.2	323° 23'.1	10'.3	359° 10'.8	54'.8	339° 20'.0	09'.6	212° 00'.2	51'.9
12	80° 58'.7	338° 22'.2	24° 10'.1 N	14° 11'.4	21° 55'.1 N	354° 21'.8	23° 09'.6 N	227° 02'.8	10° 51'.9 S
13	96° 01'.1	353° 21'.3	09'.9	29° 12'.0	55'.4	9° 23'.7	09'.6	242° 05'.4	51'.9
14	111° 03'.6	8° 20'.5	09'.7	44° 12'.6	55'.7	24° 25'.5	09'.6	257° 07'.9	51'.9
15	126° 06'.1	23° 19'.6	09'.5	59° 13'.2	56'.0	39° 27'.3	09'.6	272° 10'.5	51'.9
16	141° 08'.5	38° 18'.7	09'.3	74° 13'.8	56'.3	54° 29'.2	09'.6	287° 13'.0	51'.8
17	156° 11'.0	53° 17'.8	09'.1	89° 14'.4	56'.6	69° 31'.0	09'.7	302° 15'.6	51'.8
18	171° 13'.5	68° 17'.0	08'.9	104° 15'.0	56'.9	84° 32'.9	09'.7	317° 18'.2	51'.8
19	186° 15'.9	83° 16'.1	08'.7	119° 15'.6	57'.2	99° 34'.7	09'.7	332° 20'.7	51'.8
20	201° 18'.4	98° 15'.2	08'.5	134° 16'.1	57'.5	114° 36'.5	09'.7	347° 23'.3	51'.7
21	216° 20'.9	113° 14'.4	08'.3	149° 16'.7	57'.8	129° 38'.4	09'.7	2° 25'.9	51'.7
22	231° 23'.3	128° 13'.5	08'.1	164° 17'.3	58'.1	144° 40'.2	09'.7	17° 28'.4	51'.7
23	246° 25'.8	143° 12'.6	07'.9	179° 17'.9	58'.4	159° 42'.1	09'.8	32° 31'.0	51'.7
13 Thursday 00	261° 28'.2	158° 11'.8	24° 07'.7 N	194° 18'.5	21° 58'.7 N	174° 43'.9	23° 09'.8 N	47° 33'.5	10° 51'.6 S
01	276° 30'.7	173° 10'.9	07'.5	209° 19'.1	59'.0	189° 45'.7	09'.8	62° 36'.1	51'.6
02	291° 33'.2	188° 10'.0	07'.3	224° 19'.7	59'.3	204° 47'.6	09'.8	77° 38'.7	51'.6
03	306° 35'.6	203° 09'.1	07'.1	239° 20'.3	59'.6	219° 49'.4	09'.8	92° 41'.2	51'.6
04	321° 38'.1	218° 08'.3	06'.9	254° 20'.9	59'.9	234° 51'.3	09'.8	107° 43'.8	51'.5
05	336° 40'.6	233° 07'.4	06'.7	269° 21'.5	22° 00'.2 N	249° 53'.1	09'.9	122° 46'.3	51'.5
06	351° 43'.0	248° 06'.5	06'.4	284° 22'.1	00'.5	264° 55'.0	09'.9	137° 48'.9	51'.5
07	6° 45'.5	263° 05'.7	06'.2	299° 22'.7	00'.8	279° 56'.8	09'.9	152° 51'.5	51'.5
08	21° 48'.0	278° 04'.8	06'.0	314° 23'.3	01'.1	294° 58'.6	09'.9	167° 54'.0	51'.4
09	36° 50'.4	293° 03'.9	05'.8	329° 23'.9	01'.4	310° 00'.5	09'.9	182° 56'.6	51'.4
10	51° 52'.9	308° 03'.1	05'.6	344° 24'.5	01'.7	325° 02'.3	09'.9	197° 59'.2	51'.4
11	66° 55'.4	323° 02'.2	05'.3	359° 25'.1	02'.0	340° 04'.2	10'.0	213° 01'.7	51'.4
12	81° 57'.8	338° 01'.3	24° 05'.1 N	14° 25'.7	22° 02'.3 N	355° 06'.0	23° 10'.0 N	228° 04'.3	10° 51'.4 S
13	97° 00'.3	353° 00'.5	04'.9	29° 26'.3	02'.6	10° 07'.8	10'.0	243° 06'.8	51'.3
14	112° 02'.7	7° 59'.6	04'.7	44° 26'.8	02'.9	25° 09'.7	10'.0	258° 09'.4	51'.3
15	127° 05'.2	22° 58'.7	04'.5	59° 27'.4	03'.2	40° 11'.5	10'.0	273° 12'.0	51'.3
16	142° 07'.7	37° 57'.9	04'.2	74° 28'.0	03'.5	55° 13'.4	10'.0	288° 14'.5	51'.3
17	157° 10'.1	52° 57'.0	04'.0	89° 28'.6	03'.7	70° 15'.2	10'.1	303° 17'.1	51'.2
18	172° 12'.6	67° 56'.1	03'.8	104° 29'.2	04'.0	85° 17'.0	10'.1	318° 19'.6	51'.2
19	187° 15'.1	82° 55'.3	03'.5	119° 29'.8	04'.3	100° 18'.9	10'.1	333° 22'.2	51'.2
20	202° 17'.5	97° 54'.4	03'.3	134° 30'.4	04'.6	115° 20'.7	10'.1	348° 24'.8	51'.2
21	217° 20'.0	112° 53'.6	03'.1	149° 31'.0	04'.9	130° 22'.6	10'.1	3° 27'.3	51'.2
22	232° 22'.5	127° 52'.7	02'.8	164° 31'.6	05'.2	145° 24'.4	10'.1	18° 29'.9	51'.1
23	247° 24'.9	142° 51'.8	02'.6	179° 32'.2	05'.5	160° 26'.2	10'.2	33° 32'.4	51'.1
14 Friday 00	262° 27'.4	157° 51'.0	24° 02'.4 N	194° 32'.8	22° 05'.8 N	175° 28'.1	23° 10'.2 N	48° 35'.0	10° 51'.1 S
01	277° 29'.8	172° 50'.1	02'.1	209° 33'.4	06'.1	190° 29'.9	10'.2	63° 37'.5	51'.1
02	292° 32'.3	187° 49'.2	01'.9	224° 34'.0	06'.4	205° 31'.8	10'.2	78° 40'.1	51'.0
03	307° 34'.8	202° 48'.4	01'.7	239° 34'.6	06'.6	220° 33'.6	10'.2	93° 42'.7	51'.0
04	322° 37'.2	217° 47'.5	01'.4	254° 35'.2	06'.9	235° 35'.4	10'.2	108° 45'.2	51'.0
05	337° 39'.7	232° 46'.6	01'.2	269° 35'.8	07'.2	250° 37'.3	10'.3	123° 47'.8	51'.0
06	352° 42'.2	247° 45'.8	00'.9	284° 36'.3	07'.5	265° 39'.1	10'.3	138° 50'.3	50'.9
07	7° 44'.6	262° 44'.9	00'.7	299° 36'.9	07'.8	280° 41'.0	10'.3	153° 52'.9	50'.9
08	22° 47'.1	277° 44'.1	00'.4	314° 37'.5	08'.1	295° 42'.8	10'.3	168° 55'.5	50'.9
09	37° 49'.6	292° 43'.2	00'.2	329° 38'.1	08'.4	310° 44'.6	10'.3	183° 58'.0	50'.9
10	52° 52'.0	307° 42'.3	00'.0	344° 38'.7	08'.7	325° 46'.5	10'.3	199° 00'.6	50'.9
11	67° 54'.5	322° 41'.5	23° 59'.7 N	359° 39'.3	08'.9	340° 48'.3	10'.4	214° 03'.1	50'.8
12	82° 57'.0	337° 40'.6	23° 59'.5 N	14° 39'.9	22° 09'.2 N	355° 50'.2	23° 10'.4 N	229° 05'.7	10° 50'.8 S
13	97° 59'.4	352° 39'.8	59'.2	29° 40'.5	09'.5	10° 52'.0	10'.4	244° 08'.2	50'.8
14	113° 01'.9	7° 38'.9	58'.9	44° 41'.1	09'.8	25° 53'.8	10'.4	259° 10'.8	50'.8
15	128° 04'.3	22° 38'.0	58'.7	59° 41'.7	10'.1	40° 55'.7	10'.4	274° 13'.4	50'.8
16	143° 06'.8	37° 37'.2	58'.4	74° 42'.3	10'.4	55° 57'.5	10'.4	289° 15'.9	50'.7
17	158° 09'.3	52° 36'.3	58'.2	89° 42'.9	10'.6	70° 59'.4	10'.4	304° 18'.5	50'.7
18	173° 11'.7	67° 35'.5	57'.9	104° 43'.5	10'.9	86° 01'.2	10'.5	319° 21'.0	50'.7
19	188° 14'.2	82° 34'.6	57'.7	119° 44'.1	11'.2	101° 03'.0	10'.5	334° 23'.6	50'.7
20	203° 16'.7	97° 33'.7	57'.4	134° 44'.7	11'.5	116° 04'.9	10'.5	349° 26'.1	50'.6
21	218° 19'.1	112° 32'.9	57'.1	149° 45'.2	11'.8	131° 06'.7	10'.5	4° 28'.7	50'.6
22	233° 21'.6	127° 32'.0	56'.9	164° 45'.8	12'.1	146° 08'.6	10'.5	19° 31'.2	50'.6
23	248° 24'.1	142° 31'.2	56'.6	179° 46'.4	12'.3	161° 10'.4	10'.5	34° 33'.8	50'.6
	M.P. 06:29	v -0'.9	d 0'.2	v 0'.6	d 0'.3	v 1'.8	d 0'.0	v 2'.6	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.7	40° 15'.0 S
Achernar	335° 27'.2	57° 09'.9 S
Acrux	173° 09'.0	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.5	55° 53'.4 N
Alkaid	152° 58'.6	49° 15'.0 N
Alnair	27° 43'.6	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.5	29° 09'.8 N
Altair	62° 07'.9	8° 54'.4 N
Ankaa	353° 15'.9	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.1	69° 03'.0 S
Avior	234° 18'.5	59° 33'.5 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.4 S
Capella	280° 34'.9	46° 00'.5 N
Deneb	49° 31'.1	45° 19'.7 N
Denebola	182° 33'.6	14° 29'.8 N
Diphda	348° 56'.0	17° 54'.6 S
Dubhe	193° 51'.9	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.3 N
Enif	33° 47'.0	9° 56'.3 N
Fomalhaut	15° 23'.9	29° 32'.8 S
Gacrux	172° 00'.7	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.5 S
Hamal	328° 01'.0	23° 31'.4 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 19'.2	74° 06'.3 N
Markab	13° 38'.3	15° 16'.7 N
Menkar	314° 15'.3	4° 08'.4 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.1	69° 46'.8 S
Mirfak	308° 40'.8	49° 54'.3 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.8	56° 41'.1 S
Polaris	318° 06'.9	89° 19'.0 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.3 S
Rigil Kent	139° 51'.1	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.6	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.6 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.6 S
Vega	80° 38'.5	38° 47'.9 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	256° 43'.5	13:28
Mars	292° 50'.3	11:02
Jupiter	273° 15'.7	12:20
Saturn	146° 05'.3	20:46

	SUN		MOON				
	GHA	Dec	GHA	v	Dec	d	HP
12 00	180° 03'.4	23° 08'.6 N	141° 52'.9	13'.3	15° 50'.1 N	6'.5	54'.2
01	195° 03'.3	08'.8	156° 25'.2	13'.4	43'.6	6'.7	
02	210° 03'.2	08'.9	170° 57'.6	13'.4	36'.9	6'.7	
03	225° 03'.0	09'.1	185° 30'.0	13'.5	30'.2	6'.7	
04	240° 02'.9	09'.2	200° 02'.5	13'.4	23'.5	6'.9	
05	255° 02'.8	09'.4	214° 34'.9	13'.5	16'.6	6'.9	
06	270° 02'.6	09'.6	229° 07'.4	13'.5	09'.7	7'.0	
07	285° 02'.5	09'.7	243° 39'.9	13'.5	02'.7	7'.0	
08	300° 02'.4	09'.9	258° 12'.4	13'.5	14° 55'.7 N	7'.1	
09	315° 02'.2	10'.0	272° 44'.9	13'.6	48'.6	7'.2	54'.3
10	330° 02'.1	10'.2	287° 17'.5	13'.6	41'.4	7'.2	
11	345° 02'.0	10'.3	301° 50'.1	13'.6	34'.2	7'.3	
12	0° 01'.9	23° 10'.5 N	316° 22'.7	13'.7	14° 26'.9 N	7'.4	54'.3
13	15° 01'.7	10'.6	330° 55'.4	13'.6	19'.5	7'.4	
14	30° 01'.6	10'.8	345° 28'.0	13'.7	12'.1	7'.5	
15	45° 01'.5	10'.9	0° 00'.7	13'.7	04'.6	7'.6	
16	60° 01'.3	11'.1	14° 33'.4	13'.7	13° 57'.0 N	7'.6	
17	75° 01'.2	11'.2	29° 06'.1	13'.8	49'.4	7'.7	54'.4
18	90° 01'.1	11'.3	43° 38'.9	13'.7	41'.7	7'.8	
19	105° 00'.9	11'.5	58° 11'.6	13'.8	33'.9	7'.8	
20	120° 00'.8	11'.6	72° 44'.4	13'.8	26'.1	7'.8	
21	135° 00'.7	11'.8	87° 17'.2	13'.8	18'.3	8'.0	
22	150° 00'.5	11'.9	101° 50'.0	13'.9	10'.3	8'.0	
23	165° 00'.4	12'.1	116° 22'.9	13'.8	02'.3	8'.0	
13 00	180° 00'.3	23° 12'.2 N	130° 55'.7	13'.9	12° 54'.3 N	8'.1	54'.4
01	195° 00'.2	12'.3	145° 28'.6	13'.9	46'.2	8'.2	54'.5
02	210° 00'.0	12'.5	160° 01'.5	13'.9	38'.0	8'.2	
03	224° 59'.9	12'.6	174° 34'.4	14'.0	29'.8	8'.3	
04	239° 59'.8	12'.8	189° 07'.4	13'.9	21'.5	8'.4	
05	254° 59'.6	12'.9	203° 40'.3	14'.0	13'.1	8'.4	
06	269° 59'.5	13'.0	218° 13'.3	14'.0	04'.7	8'.4	
07	284° 59'.4	13'.2	232° 46'.3	14'.0	11° 56'.3 N	8'.5	54'.6
08	299° 59'.2	13'.3	247° 19'.3	14'.0	47'.8	8'.6	
09	314° 59'.1	13'.4	261° 52'.3	14'.0	39'.2	8'.6	
10	329° 59'.0	13'.6	276° 25'.3	14'.1	30'.6	8'.7	
11	344° 58'.8	13'.7	290° 58'.4	14'.1	21'.9	8'.7	
12	359° 58'.7	23° 13'.8 N	305° 31'.5	14'.0	11° 13'.2 N	8'.8	54'.6
13	14° 58'.6	14'.0	320° 04'.5	14'.1	04'.4	8'.8	54'.7
14	29° 58'.4	14'.1	334° 37'.6	14'.1	10° 55'.6 N	8'.9	
15	44° 58'.3	14'.2	349° 10'.7	14'.1	46'.7	8'.9	
16	59° 58'.2	14'.4	3° 43'.8	14'.2	37'.8	9'.0	
17	74° 58'.0	14'.5	18° 17'.0	14'.1	28'.8	9'.0	
18	89° 57'.9	14'.6	32° 50'.1	14'.1	19'.8	9'.1	
19	104° 57'.8	14'.8	47° 23'.2	14'.2	10'.7	9'.1	54'.8
20	119° 57'.6	14'.9	61° 56'.4	14'.2	01'.6	9'.2	
21	134° 57'.5	15'.0	76° 29'.6	14'.1	9° 52'.4 N	9'.3	
22	149° 57'.4	15'.1	91° 02'.7	14'.2	43'.1	9'.2	
23	164° 57'.2	15'.3	105° 35'.9	14'.2	33'.9	9'.3	
14 00	179° 57'.1	23° 15'.4 N	120° 09'.1	14'.2	9° 24'.6 N	9'.4	54'.9
01	194° 57'.0	15'.5	134° 42'.3	14'.2	15'.2	9'.4	
02	209° 56'.9	15'.6	149° 15'.5	14'.2	05'.8	9'.5	
03	224° 56'.7	15'.8	163° 48'.7	14'.2	8° 56'.3 N	9'.5	
04	239° 56'.6	15'.9	178° 21'.9	14'.3	46'.8	9'.5	
05	254° 56'.5	16'.0	192° 55'.2	14'.2	37'.3	9'.6	55'.0
06	269° 56'.3	16'.1	207° 28'.4	14'.2	27'.7	9'.6	
07	284° 56'.2	16'.2	222° 01'.6	14'.3	18'.1	9'.7	
08	299° 56'.1	16'.4	236° 34'.9	14'.2	08'.4	9'.7	
09	314° 55'.9	16'.5	251° 08'.1	14'.2	7° 58'.7 N	9'.8	
10	329° 55'.8	16'.6	265° 41'.3	14'.3	48'.9	9'.8	55'.1
11	344° 55'.7	16'.7	280° 14'.6	14'.2	39'.1	9'.8	
12	359° 55'.5	23° 16'.8 N	294° 47'.8	14'.2	7° 29'.3 N	9'.9	55'.1
13	14° 55'.4	16'.9	309° 21'.0	14'.3	19'.4	9'.9	
14	29° 55'.3	17'.1	323° 54'.3	14'.2	09'.5	10'.0	55'.2
15	44° 55'.1	17'.2	338° 27'.5	14'.2	6° 59'.5 N	10'.0	
16	59° 55'.0	17'.3	353° 00'.7	14'.3	49'.5	10'.0	
17	74° 54'.9	17'.4	7° 34'.0	14'.2	39'.5	10'.1	
18	89° 54'.7	17'.5	22° 07'.2	14'.2	29'.4	10'.1	55'.3
19	104° 54'.6	17'.6	36° 40'.4	14'.2	19'.3	10'.1	
20	119° 54'.5	17'.7	51° 13'.6	14'.3	09'.2	10'.2	
21	134° 54'.3	17'.8	65° 46'.9	14'.2	5° 59'.0 N	10'.2	
22	149° 54'.2	17'.9	80° 20'.1	14'.2	48'.8	10'.2	55'.4
23	164° 54'.1	18'.1	94° 53'.3	14'.1	38'.6	10'.3	
	SD 15'.7	d 0'.1	SD	14'.8	14'.9	15'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14
N 72°	-	-	-	04:55	06:47	08:33
N 70°	-	-	-	05:31	07:09	08:45
68°	-	-	-	05:56	07:25	08:55
66°	-	-	-	06:16	07:39	09:03
64°	-	-	01:35	06:31	07:50	09:10
62°	-	-	02:11	06:44	07:59	09:16
60°	-	00:56	02:37	06:55	08:07	09:21
N 58°	-	01:43	02:57	07:04	08:14	09:26
56°	-	02:12	03:14	07:13	08:20	09:30
54°	00:51	02:34	03:28	07:20	08:26	09:33
52°	01:34	02:51	03:40	07:27	08:31	09:36
50°	02:01	03:06	03:50	07:33	08:35	09:39
45°	02:46	03:35	04:13	07:45	08:45	09:46
N 40°	03:16	03:58	04:31	07:56	08:53	09:51
35°	03:39	04:16	04:45	08:05	09:00	09:56
30°	03:58	04:31	04:58	08:13	09:06	10:00
20°	04:26	04:56	05:20	08:26	09:16	10:06
N 10°	04:49	05:16	05:39	08:38	09:25	10:13
0°	05:08	05:34	05:56	08:49	09:34	10:18
S 10°	05:25	05:51	06:14	09:00	09:42	10:24
20°	05:41	06:08	06:32	09:12	09:52	10:30
30°	05:57	06:27	06:53	09:25	10:02	10:37
35°	06:06	06:37	07:05	09:33	10:08	10:41
40°	06:15	06:49	07:19	09:42	10:14	10:45
45°	06:25	07:02	07:36	09:52	10:22	10:50
S 50°	06:37	07:18	07:57	10:04	10:32	10:56
52°	06:42	07:26	08:06	10:10	10:36	10:59
54°	06:47	07:34	08:17	10:16	10:41	11:02
56°	06:54	07:43	08:30	10:23	10:46	11:06
58°	07:00	07:53	08:44	10:31	10:52	11:10
S 60°	07:08	08:04	09:02	10:40	10:58	11:14
S 62°	07:16	08:18	09:23	10:51	11:06	11:19

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 12	Moonset 13	Moonset 14
N 72°	-	-	-	00:33	00:14	00:01 23:49
N 70°	-	-	-	23:51	23:46	23:42
68°	-	-	-	23:33	23:35	23:36
66°	-	-	-	23:19	23:26	23:31
64°	22:26	-	-	23:07	23:18	23:26
62°	21:49	-	-	22:57	23:11	23:23
60°	21:24	23:06	-	22:48	23:05	23:19
N 58°	21:04	22:18	-	22:40	22:59	23:16
56°	20:47	21:49	-	22:34	22:55	23:14
54°	20:33	21:27	23:10	22:28	22:50	23:11
52°	20:21	21:09	22:26	22:22	22:47	23:09
50°	20:10	20:54	21:59	22:17	22:43	23:07
45°	19:48	20:25	21:14	22:06	22:35	23:03
N 40°	19:30	20:03	20:44	21:57	22:29	22:59
35°	19:15	19:44	20:21	21:50	22:23	22:56
30°	19:02	19:29	20:03	21:43	22:18	22:53
20°	18:40	19:05	19:34	21:31	22:10	22:48
N 10°	18:21	18:44	19:11	21:21	22:02	22:44
0°	18:04	18:26	18:52	21:11	21:55	22:39
S 10°	17:46	18:09	18:36	21:01	21:48	22:35
20°	17:28	17:52	18:20	20:50	21:40	22:31
30°	17:07	17:33	18:03	20:38	21:32	22:26
35°	16:55	17:23	17:55	20:31	21:27	22:23
40°	16:41	17:11	17:45	20:23	21:21	22:19
45°	16:24	16:58	17:35	20:14	21:14	22:15
S 50°	16:04	16:42	17:23	20:02	21:06	22:11
52°	15:54	16:35	17:18	19:57	21:02	22:08
54°	15:43	16:26	17:13	19:51	20:58	22:06
56°	15:30	16:17	17:06	19:45	20:53	22:03
58°	15:16	16:07	17:00	19:37	20:48	22:00
S 60°	14:59	15:56	16:52	19:29	20:42	21:57
S 62°	14:37	15:42	16:44	19:19	20:35	21:53

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
12	0 14	0 08	12:00	15:00	02:37	4d 13%
13	0 01	0 05	12:00	15:45	03:22	5d 20%
14	0 11	0 18	12:00	16:29	04:07	6d 28%

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2013 June 15, 16, 17 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
15 Saturday 00	263° 26'.5	157° 30'.3	23° 56'.4 N	194° 47'.0	22° 12'.6 N	176° 12'.2	23° 10'.6 N	49° 36'.4	10° 50'.6 S
01	278° 29'.0	172° 29'.5	56'.1	209° 47'.6	12'.9	191° 14'.1	10'.6	64° 38'.9	50'.5
02	293° 31'.5	187° 28'.6	55'.8	224° 48'.2	13'.2	206° 15'.9	10'.6	79° 41'.5	50'.5
03	308° 33'.9	202° 27'.7	55'.6	239° 48'.8	13'.5	221° 17'.8	10'.6	94° 44'.0	50'.5
04	323° 36'.4	217° 26'.9	55'.3	254° 49'.4	13'.7	236° 19'.6	10'.6	109° 46'.6	50'.5
05	338° 38'.8	232° 26'.0	55'.0	269° 50'.0	14'.0	251° 21'.4	10'.6	124° 49'.1	50'.5
06	353° 41'.3	247° 25'.2	54'.7	284° 50'.6	14'.3	266° 23'.3	10'.6	139° 51'.7	50'.4
07	8° 43'.8	262° 24'.3	54'.5	299° 51'.2	14'.6	281° 25'.1	10'.7	154° 54'.2	50'.4
08	23° 46'.2	277° 23'.5	54'.2	314° 51'.8	14'.8	296° 27'.0	10'.7	169° 56'.8	50'.4
09	38° 48'.7	292° 22'.6	53'.9	329° 52'.4	15'.1	311° 28'.8	10'.7	184° 59'.3	50'.4
10	53° 51'.2	307° 21'.7	53'.6	344° 53'.0	15'.4	326° 30'.6	10'.7	200° 01'.9	50'.4
11	68° 53'.6	322° 20'.9	53'.4	359° 53'.6	15'.7	341° 32'.5	10'.7	215° 04'.5	50'.3
12	83° 56'.1	337° 20'.0	23° 53'.1 N	14° 54'.1	22° 15'.9 N	356° 34'.3	23° 10'.7 N	230° 07'.0	10° 50'.3 S
13	98° 58'.6	352° 19'.2	52'.8	29° 54'.7	16'.2	11° 36'.2	10'.7	245° 09'.6	50'.3
14	114° 01'.0	7° 18'.3	52'.5	44° 55'.3	16'.5	26° 38'.0	10'.8	260° 12'.1	50'.3
15	129° 03'.5	22° 17'.5	52'.2	59° 55'.9	16'.8	41° 39'.8	10'.8	275° 14'.7	50'.3
16	144° 05'.9	37° 16'.6	51'.9	74° 56'.5	17'.0	56° 41'.7	10'.8	290° 17'.2	50'.2
17	159° 08'.4	52° 15'.8	51'.7	89° 57'.1	17'.3	71° 43'.5	10'.8	305° 19'.8	50'.2
18	174° 10'.9	67° 14'.9	51'.4	104° 57'.7	17'.6	86° 45'.4	10'.8	320° 22'.3	50'.2
19	189° 13'.3	82° 14'.1	51'.1	119° 58'.3	17'.9	101° 47'.2	10'.8	335° 24'.9	50'.2
20	204° 15'.8	97° 13'.2	50'.8	134° 58'.9	18'.1	116° 49'.1	10'.8	350° 27'.4	50'.1
21	219° 18'.3	112° 12'.4	50'.5	149° 59'.5	18'.4	131° 50'.9	10'.9	5° 30'.0	50'.1
22	234° 20'.7	127° 11'.5	50'.2	165° 00'.1	18'.7	146° 52'.7	10'.9	20° 32'.5	50'.1
23	249° 23'.2	142° 10'.7	49'.9	180° 00'.7	19'.0	161° 54'.6	10'.9	35° 35'.1	50'.1
16 Sunday 00	264° 25'.7	157° 09'.8	23° 49'.6 N	195° 01'.3	22° 19'.2 N	176° 56'.4	23° 10'.9 N	50° 37'.6	10° 50'.1 S
01	279° 28'.1	172° 09'.0	49'.3	210° 01'.8	19'.5	191° 58'.3	10'.9	65° 40'.2	50'.1
02	294° 30'.6	187° 08'.1	49'.0	225° 02'.4	19'.8	207° 00'.1	10'.9	80° 42'.7	50'.0
03	309° 33'.1	202° 07'.3	48'.7	240° 03'.0	20'.0	222° 01'.9	10'.9	95° 45'.3	50'.0
04	324° 35'.5	217° 06'.4	48'.4	255° 03'.6	20'.3	237° 03'.8	11'.0	110° 47'.8	50'.0
05	339° 38'.0	232° 05'.6	48'.1	270° 04'.2	20'.6	252° 05'.6	11'.0	125° 50'.4	50'.0
06	354° 40'.4	247° 04'.7	47'.8	285° 04'.8	20'.9	267° 07'.5	11'.0	140° 52'.9	50'.0
07	9° 42'.9	262° 03'.9	47'.5	300° 05'.4	21'.1	282° 09'.3	11'.0	155° 55'.5	49'.9
08	24° 45'.4	277° 03'.0	47'.2	315° 06'.0	21'.4	297° 11'.1	11'.0	170° 58'.0	49'.9
09	39° 47'.8	292° 02'.2	46'.9	330° 06'.6	21'.7	312° 13'.0	11'.0	186° 00'.6	49'.9
10	54° 50'.3	307° 01'.3	46'.6	345° 07'.2	21'.9	327° 14'.8	11'.0	201° 03'.1	49'.9
11	69° 52'.8	322° 00'.5	46'.3	0° 07'.8	22'.2	342° 16'.7	11'.1	216° 05'.7	49'.9
12	84° 55'.2	336° 59'.6	23° 46'.0 N	15° 08'.4	22° 22'.5 N	357° 18'.5	23° 11'.1 N	231° 08'.2	10° 49'.8 S
13	99° 57'.7	351° 58'.8	45'.7	30° 09'.0	22'.7	12° 20'.3	11'.1	246° 10'.8	49'.8
14	115° 00'.2	6° 57'.9	45'.4	45° 09'.6	23'.0	27° 22'.2	11'.1	261° 13'.3	49'.8
15	130° 02'.6	21° 57'.1	45'.1	60° 10'.1	23'.3	42° 24'.0	11'.1	276° 15'.9	49'.8
16	145° 05'.1	36° 56'.2	44'.8	75° 10'.7	23'.5	57° 25'.9	11'.1	291° 18'.4	49'.8
17	160° 07'.6	51° 55'.4	44'.4	90° 11'.3	23'.8	72° 27'.7	11'.1	306° 21'.0	49'.7
18	175° 10'.0	66° 54'.6	44'.1	105° 11'.9	24'.1	87° 29'.5	11'.1	321° 23'.5	49'.7
19	190° 12'.5	81° 53'.7	43'.8	120° 12'.5	24'.3	102° 31'.4	11'.2	336° 26'.1	49'.7
20	205° 14'.9	96° 52'.9	43'.5	135° 13'.1	24'.6	117° 33'.2	11'.2	351° 28'.6	49'.7
21	220° 17'.4	111° 52'.0	43'.2	150° 13'.7	24'.8	132° 35'.1	11'.2	6° 31'.2	49'.7
22	235° 19'.9	126° 51'.2	42'.9	165° 14'.3	25'.1	147° 36'.9	11'.2	21° 33'.7	49'.6
23	250° 22'.3	141° 50'.3	42'.5	180° 14'.9	25'.4	162° 38'.7	11'.2	36° 36'.3	49'.6
17 Monday 00	265° 24'.8	156° 49'.5	23° 42'.2 N	195° 15'.5	22° 25'.6 N	177° 40'.6	23° 11'.2 N	51° 38'.8	10° 49'.6 S
01	280° 27'.3	171° 48'.7	41'.9	210° 16'.1	25'.9	192° 42'.4	11'.2	66° 41'.4	49'.6
02	295° 29'.7	186° 47'.8	41'.6	225° 16'.7	26'.2	207° 44'.3	11'.3	81° 43'.9	49'.6
03	310° 32'.2	201° 47'.0	41'.2	240° 17'.3	26'.4	222° 46'.1	11'.3	96° 46'.5	49'.6
04	325° 34'.7	216° 46'.1	40'.9	255° 17'.8	26'.7	237° 47'.9	11'.3	111° 49'.0	49'.5
05	340° 37'.1	231° 45'.3	40'.6	270° 18'.4	26'.9	252° 49'.8	11'.3	126° 51'.6	49'.5
06	355° 39'.6	246° 44'.4	40'.2	285° 19'.0	27'.2	267° 51'.6	11'.3	141° 54'.1	49'.5
07	10° 42'.0	261° 43'.6	39'.9	300° 19'.6	27'.5	282° 53'.5	11'.3	156° 56'.7	49'.5
08	25° 44'.5	276° 42'.8	39'.6	315° 20'.2	27'.7	297° 55'.3	11'.3	171° 59'.2	49'.5
09	40° 47'.0	291° 41'.9	39'.2	330° 20'.8	28'.0	312° 57'.1	11'.3	187° 01'.8	49'.4
10	55° 49'.4	306° 41'.1	38'.9	345° 21'.4	28'.2	327° 59'.0	11'.4	202° 04'.3	49'.4
11	70° 51'.9	321° 40'.2	38'.6	0° 22'.0	28'.5	343° 00'.8	11'.4	217° 06'.9	49'.4
12	85° 54'.4	336° 39'.4	23° 38'.2 N	15° 22'.6	22° 28'.8 N	358° 02'.7	23° 11'.4 N	232° 09'.4	10° 49'.4 S
13	100° 56'.8	351° 38'.6	37'.9	30° 23'.2	29'.0	13° 04'.5	11'.4	247° 11'.9	49'.4
14	115° 59'.3	6° 37'.7	37'.6	45° 23'.8	29'.3	28° 06'.3	11'.4	262° 14'.5	49'.4
15	131° 01'.8	21° 36'.9	37'.2	60° 24'.4	29'.5	43° 08'.2	11'.4	277° 17'.0	49'.3
16	146° 04'.2	36° 36'.1	36'.9	75° 24'.9	29'.8	58° 10'.0	11'.4	292° 19'.6	49'.3
17	161° 06'.7	51° 35'.2	36'.5	90° 25'.5	30'.0	73° 11'.9	11'.4	307° 22'.1	49'.3
18	176° 09'.2	66° 34'.4	36'.2	105° 26'.1	30'.3	88° 13'.7	11'.5	322° 24'.7	49'.3
19	191° 11'.6	81° 33'.5	35'.8	120° 26'.7	30'.6	103° 15'.5	11'.5	337° 27'.2	49'.3
20	206° 14'.1	96° 32'.7	35'.5	135° 27'.3	30'.8	118° 17'.4	11'.5	352° 29'.8	49'.3
21	221° 16'.5	111° 31'.9	35'.2	150° 27'.9	31'.1	133° 19'.2	11'.5	7° 32'.3	49'.2
22	236° 19'.0	126° 31'.0	34'.8	165° 28'.5	31'.3	148° 21'.1	11'.5	22° 34'.9	49'.2
23	251° 21'.5	141° 30'.2	34'.5	180° 29'.1	31'.6	163° 22'.9	11'.5	37° 37'.4	49'.2
	M.P. 06:17	v -0'.8	d 0'.3	v 0'.6	d 0'.3	v 1'.8	d 0'.0	v 2'.5	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.7	40° 15'.0 S
Achernar	335° 27'.1	57° 09'.9 S
Acrux	173° 09'.1	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.6	55° 53'.4 N
Alkaid	152° 58'.7	49° 15'.0 N
Alnair	27° 43'.6	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.5	29° 09'.8 N
Altair	62° 07'.9	8° 54'.4 N
Ankaa	353° 15'.8	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.8 N
Atria	107° 27'.1	69° 03'.0 S
Avior	234° 18'.5	59° 33'.5 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.4 S
Capella	280° 34'.9	46° 00'.5 N
Deneb	49° 31'.1	45° 19'.7 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 56'.0	17° 54'.6 S
Dubhe	193° 51'.9	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.4 N
Enif	33° 46'.9	9° 56'.3 N
Fomalhaut	15° 23'.9	29° 32'.8 S
Gacrux	172° 00'.7	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.5 S
Hamal	328° 00'.9	23° 31'.4 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 19'.2	74° 06'.3 N
Markab	13° 38'.3	15° 16'.7 N
Menkar	314° 15'.3	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.2	69° 46'.8 S
Mirfak	308° 40'.7	49° 54'.3 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.8	56° 41'.1 S
Polaris	318° 05'.9	89° 19'.0 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.3 S
Rigil Kent	139° 51'.1	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.6	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.6 S
Vega	80° 38'.5	38° 47'.9 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	252° 44'.2	13:32
Mars	290° 35'.6	10:59
Jupiter	272° 30'.7	12:11
Saturn	146° 12'.0	20:34

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
15 00	179° 53'.9	23° 18'.2 N	109° 26'.4	14'.2	5° 28'.3 N	10'.3	55'.4
01	194° 53'.8	18'.3	123° 59'.6	14'.2	18'.0	10'.3	
02	209° 53'.7	18'.4	138° 32'.8	14'.2	07'.7	10'.4	55'.5
03	224° 53'.5	18'.5	153° 06'.0	14'.1	4° 57'.3 N	10'.4	
04	239° 53'.4	18'.6	167° 39'.1	14'.1	46'.9	10'.4	
05	254° 53'.3	18'.7	182° 12'.2	14'.2	36'.5	10'.5	
06	269° 53'.1	18'.8	196° 45'.4	14'.1	26'.0	10'.5	55'.6
07	284° 53'.0	18'.9	211° 18'.5	14'.1	15'.5	10'.5	
08	299° 52'.8	19'.0	225° 51'.6	14'.1	05'.0	10'.6	
09	314° 52'.7	19'.1	240° 24'.7	14'.0	3° 54'.4 N	10'.5	
10	329° 52'.6	19'.2	254° 57'.7	14'.1	43'.9	10'.6	55'.7
11	344° 52'.4	19'.3	269° 30'.8	14'.0	33'.3	10'.6	
12	359° 52'.3	23° 19'.4 N	284° 03'.8	14'.0	3° 22'.7 N	10'.7	55'.7
13	14° 52'.2	19'.5	298° 36'.8	14'.0	12'.0	10'.7	55'.8
14	29° 52'.0	19'.6	313° 09'.8	14'.0	01'.3	10'.7	
15	44° 51'.9	19'.7	327° 42'.8	14'.0	2° 50'.6 N	10'.7	
16	59° 51'.8	19'.8	342° 15'.8	13'.9	39'.9	10'.7	
17	74° 51'.6	19'.9	356° 48'.7	13'.9	29'.2	10'.8	55'.9
18	89° 51'.5	20'.0	11° 21'.6	13'.9	18'.4	10'.8	
19	104° 51'.4	20'.1	25° 54'.5	13'.9	07'.6	10'.8	
20	119° 51'.2	20'.2	40° 27'.4	13'.8	1° 56'.8 N	10'.8	56'.0
21	134° 51'.1	20'.2	55° 00'.2	13'.8	46'.0	10'.9	
22	149° 51'.0	20'.3	69° 33'.0	13'.8	35'.1	10'.8	
23	164° 50'.8	20'.4	84° 05'.8	13'.8	24'.3	10'.9	56'.1
16 00	179° 50'.7	23° 20'.5 N	98° 38'.6	13'.7	1° 13'.4 N	10'.9	56'.1
01	194° 50'.6	20'.6	113° 11'.3	13'.7	02'.5	10'.9	
02	209° 50'.4	20'.7	127° 44'.0	13'.7	0° 51'.6 N	11'.0	
03	224° 50'.3	20'.8	142° 16'.7	13'.6	40'.6	10'.9	56'.2
04	239° 50'.2	20'.9	156° 49'.3	13'.6	29'.7	11'.0	
05	254° 50'.0	21'.0	171° 21'.9	13'.6	18'.7	11'.0	
06	269° 49'.9	21'.0	185° 54'.5	13'.5	07'.7	10'.9	56'.3
07	284° 49'.8	21'.1	200° 27'.0	13'.6	0° 03'.2 S	11'.0	
08	299° 49'.6	21'.2	214° 59'.6	13'.4	14'.2	11'.1	
09	314° 49'.5	21'.3	229° 32'.0	13'.5	25'.3	11'.0	56'.4
10	329° 49'.4	21'.4	244° 04'.5	13'.4	36'.3	11'.0	
11	344° 49'.2	21'.5	258° 36'.9	13'.3	47'.3	11'.1	
12	359° 49'.1	23° 21'.5 N	273° 09'.2	13'.4	0° 58'.4 S	11'.0	56'.5
13	14° 48'.9	21'.6	287° 41'.6	13'.2	1° 09'.4 S	11'.1	
14	29° 48'.8	21'.7	302° 13'.8	13'.3	20'.5	11'.0	
15	44° 48'.7	21'.8	316° 46'.1	13'.2	31'.5	11'.1	56'.6
16	59° 48'.5	21'.9	331° 18'.3	13'.2	42'.6	11'.1	
17	74° 48'.4	21'.9	345° 50'.5	13'.1	53'.7	11'.1	
18	89° 48'.3	22'.0	0° 22'.6	13'.0	2° 04'.8 S	11'.1	56'.7
19	104° 48'.1	22'.1	14° 54'.6	13'.1	15'.9	11'.1	
20	119° 48'.0	22'.2	29° 26'.7	13'.0	27'.0	11'.1	
21	134° 47'.9	22'.2	43° 58'.7	12'.9	38'.1	11'.0	56'.8
22	149° 47'.7	22'.3	58° 30'.6	12'.9	49'.1	11'.1	
23	164° 47'.6	22'.4	73° 02'.5	12'.8	3° 00'.2 S	11'.1	56'.9
17 00	179° 47'.5	23° 22'.5 N	87° 34'.3	12'.8	3° 11'.3 S	11'.1	56'.9
01	194° 47'.3	22'.5	102° 06'.1	12'.7	22'.4	11'.1	
02	209° 47'.2	22'.6	116° 37'.8	12'.7	33'.5	11'.1	57'.0
03	224° 47'.1	22'.7	131° 09'.5	12'.7	44'.6	11'.1	
04	239° 46'.9	22'.7	145° 41'.2	12'.5	55'.7	11'.1	
05	254° 46'.8	22'.8	160° 12'.7	12'.6	4° 06'.8 S	11'.0	57'.1
06	269° 46'.7	22'.9	174° 44'.3	12'.4	17'.8	11'.1	
07	284° 46'.5	23'.0	189° 15'.7	12'.4	28'.9	11'.1	
08	299° 46'.4	23'.0	203° 47'.1	12'.4	40'.0	11'.0	57'.2
09	314° 46'.2	23'.1	218° 18'.5	12'.3	51'.0	11'.1	
10	329° 46'.1	23'.2	232° 49'.8	12'.2	5° 02'.1 S	11'.0	57'.3
11	344° 46'.0	23'.2	247° 21'.0	12'.2	13'.1	11'.0	
12	359° 45'.8	23° 23'.3 N	261° 52'.2	12'.1	5° 24'.1 S	11'.0	57'.3
13	14° 45'.7	23'.3	276° 23'.3	12'.1	35'.1	11'.0	57'.4
14	29° 45'.6	23'.4	290° 54'.4	12'.0	46'.1	11'.0	
15	44° 45'.4	23'.5	305° 25'.4	11'.9	57'.1	11'.0	
16	59° 45'.3	23'.5	319° 56'.3	11'.9	6° 08'.1 S	10'.9	57'.5
17	74° 45'.2	23'.6	334° 27'.2	11'.8	19'.0	11'.0	
18	89° 45'.0	23'.7	348° 58'.0	11'.7	30'.0	10'.9	57'.6
19	104° 44'.9	23'.7	3° 28'.7	11'.7	40'.9	10'.9	
20	119° 44'.8	23'.8	17° 59'.4	11'.6	51'.8	10'.9	
21	134° 44'.6	23'.8	32° 30'.0	11'.5	7° 02'.7 S	10'.8	57'.7
22	149° 44'.5	23'.9	47° 00'.5	11'.5	13'.5	10'.9	
23	164° 44'.3	23'.9	61° 31'.0	11'.4	24'.4	10'.8	57'.8
	SD 15'.7	d 0'.1	SD	15'.2	15'.4	15'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 15	Moonrise 16	Moonrise 17
N 72°	-	-	-	10:16	12:01	13:50
N 70°	-	-	-	10:22	11:59	13:41
68°	-	-	-	10:26	11:58	13:34
66°	-	-	-	10:29	11:57	13:28
64°	-	-	01:32	10:32	11:56	13:23
62°	-	-	02:10	10:35	11:55	13:19
60°	-	00:52	02:36	10:37	11:55	13:15
N 58°	-	01:41	02:56	10:39	11:54	13:12
56°	-	02:11	03:13	10:41	11:54	13:09
54°	00:47	02:33	03:27	10:42	11:53	13:07
52°	01:33	02:51	03:39	10:44	11:53	13:04
50°	02:00	03:06	03:50	10:45	11:52	13:02
45°	02:46	03:35	04:13	10:48	11:52	12:58
N 40°	03:16	03:58	04:31	10:50	11:51	12:54
35°	03:39	04:16	04:46	10:52	11:50	12:50
30°	03:58	04:31	04:59	10:54	11:50	12:48
20°	04:27	04:56	05:21	10:57	11:49	12:43
N 10°	04:49	05:16	05:40	11:00	11:48	12:38
0°	05:08	05:35	05:57	11:02	11:47	12:34
S 10°	05:25	05:52	06:14	11:05	11:47	12:30
20°	05:41	06:09	06:33	11:08	11:46	12:26
30°	05:58	06:28	06:54	11:11	11:45	12:21
35°	06:07	06:38	07:06	11:13	11:45	12:18
40°	06:16	06:50	07:21	11:15	11:44	12:15
45°	06:26	07:04	07:37	11:17	11:44	12:12
S 50°	06:38	07:20	07:58	11:20	11:43	12:08
52°	06:43	07:27	08:08	11:21	11:43	12:06
54°	06:49	07:35	08:19	11:23	11:43	12:04
56°	06:55	07:44	08:32	11:24	11:42	12:01
58°	07:02	07:54	08:46	11:26	11:42	11:59
S 60°	07:09	08:06	09:04	11:28	11:41	11:56
S 62°	07:18	08:20	09:25	11:30	11:41	11:53

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 15	Moonset 16	Moonset 17
N 72°	-	-	-	23:39	23:29	23:18
N 70°	-	-	-	23:38	23:33	23:28
68°	-	-	-	23:36	23:37	23:37
66°	-	-	-	23:35	23:40	23:45
64°	22:30	-	-	23:34	23:42	23:51
62°	21:52	-	-	23:33	23:44	23:57
60°	21:26	23:11	-	23:33	23:46	24:01
N 58°	21:06	22:21	-	23:32	23:48	24:06
56°	20:49	21:51	-	23:32	23:50	24:10
54°	20:35	21:29	23:15	23:31	23:51	24:13
52°	20:22	21:11	22:29	23:31	23:52	24:16
50°	20:11	20:56	22:01	23:30	23:54	24:19
45°	19:49	20:26	21:16	23:29	23:56	24:25
N 40°	19:31	20:04	20:45	23:28	23:58	24:30
35°	19:16	19:46	20:22	23:28	-	00:00
30°	19:03	19:30	20:04	23:27	-	00:02
20°	18:41	19:05	19:35	23:26	-	00:05
N 10°	18:22	18:45	19:12	23:25	-	00:07
0°	18:04	18:27	18:53	23:24	-	00:10
S 10°	17:47	18:10	18:36	23:23	-	00:12
20°	17:28	17:53	18:20	23:22	-	00:14
30°	17:07	17:34	18:04	23:21	-	00:17
35°	16:55	17:23	17:55	23:20	-	00:19
40°	16:41	17:11	17:45	23:19	-	00:21
45°	16:24	16:58	17:35	23:18	-	00:23
S 50°	16:03	16:42	17:23	23:17	-	00:25
52°	15:53	16:34	17:18	23:16	-	00:27
54°	15:42	16:26	17:12	23:16	-	00:28
56°	15:30	16:17	17:06	23:15	-	00:29
58°	15:15	16:07	17:00	23:14	-	00:31
S 60°	14:58	15:55	16:52	23:14	-	00:33
S 62°	14:36	15:42	16:44	23:13	-	00:35

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
15	0 24	0 30	12:01	17:13	04:51	7d 38%
16	0 37	0 43	12:01	17:58	05:36	8d 48%
17	0 50	0 56	12:01	18:46	06:22	9d 58%

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2013 June 18, 19, 20 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
18 Tuesday 00	266° 23'.9	156° 29'.4	23° 34'.1 N	195° 29'.7	22° 31'.8 N	178° 24'.7	23° 11'.5 N	52° 39'.9	10° 49'.2 S
01	281° 26'.4	171° 28'.5	33'.7	210° 30'.3	32'.1	193° 26'.6	11'.5	67° 42'.5	49'.2
02	296° 28'.9	186° 27'.7	33'.4	225° 30'.9	32'.3	208° 28'.4	11'.6	82° 45'.0	49'.1
03	311° 31'.3	201° 26'.9	33'.0	240° 31'.5	32'.6	223° 30'.3	11'.6	97° 47'.6	49'.1
04	326° 33'.8	216° 26'.0	32'.7	255° 32'.1	32'.8	238° 32'.1	11'.6	112° 50'.1	49'.1
05	341° 36'.3	231° 25'.2	32'.3	270° 32'.6	33'.1	253° 33'.9	11'.6	127° 52'.7	49'.1
06	356° 38'.7	246° 24'.4	32'.0	285° 33'.2	33'.3	268° 35'.8	11'.6	142° 55'.2	49'.1
07	11° 41'.2	261° 23'.5	31'.6	300° 33'.8	33'.6	283° 37'.6	11'.6	157° 57'.8	49'.1
08	26° 43'.7	276° 22'.7	31'.2	315° 34'.4	33'.8	298° 39'.5	11'.6	173° 00'.3	49'.0
09	41° 46'.1	291° 21'.9	30'.9	330° 35'.0	34'.1	313° 41'.3	11'.6	188° 02'.8	49'.0
10	56° 48'.6	306° 21'.0	30'.5	345° 35'.6	34'.3	328° 43'.1	11'.6	203° 05'.4	49'.0
11	71° 51'.0	321° 20'.2	30'.2	0° 36'.2	34'.6	343° 45'.0	11'.7	218° 07'.9	49'.0
12	86° 53'.5	336° 19'.4	23° 29'.8 N	15° 36'.8	22° 34'.8 N	358° 46'.8	23° 11'.7 N	233° 10'.5	10° 49'.0 S
13	101° 56'.0	351° 18'.5	29'.4	30° 37'.4	35'.1	13° 48'.6	11'.7	248° 13'.0	49'.0
14	116° 58'.4	6° 17'.7	29'.1	45° 38'.0	35'.3	28° 50'.5	11'.7	263° 15'.6	48'.9
15	132° 00'.9	21° 16'.9	28'.7	60° 38'.6	35'.6	43° 52'.3	11'.7	278° 18'.1	48'.9
16	147° 03'.4	36° 16'.1	28'.3	75° 39'.2	35'.8	58° 54'.2	11'.7	293° 20'.6	48'.9
17	162° 05'.8	51° 15'.2	27'.9	90° 39'.7	36'.1	73° 56'.0	11'.7	308° 23'.2	48'.9
18	177° 08'.3	66° 14'.4	27'.6	105° 40'.3	36'.3	88° 57'.8	11'.7	323° 25'.7	48'.9
19	192° 10'.8	81° 13'.6	27'.2	120° 40'.9	36'.6	103° 59'.7	11'.7	338° 28'.3	48'.9
20	207° 13'.2	96° 12'.7	26'.8	135° 41'.5	36'.8	119° 01'.5	11'.8	353° 30'.8	48'.8
21	222° 15'.7	111° 11'.9	26'.4	150° 42'.1	37'.1	134° 03'.4	11'.8	8° 33'.3	48'.8
22	237° 18'.1	126° 11'.1	26'.1	165° 42'.7	37'.3	149° 05'.2	11'.8	23° 35'.9	48'.8
23	252° 20'.6	141° 10'.3	25'.7	180° 43'.3	37'.6	164° 07'.0	11'.8	38° 38'.4	48'.8
19 Wednesday 00	267° 23'.1	156° 09'.4	23° 25'.3 N	195° 43'.9	22° 37'.8 N	179° 08'.9	23° 11'.8 N	53° 41'.0	10° 48'.8 S
01	282° 25'.5	171° 08'.6	24'.9	210° 44'.5	38'.1	194° 10'.7	11'.8	68° 43'.5	48'.8
02	297° 28'.0	186° 07'.8	24'.5	225° 45'.1	38'.3	209° 12'.6	11'.8	83° 46'.1	48'.8
03	312° 30'.5	201° 07'.0	24'.2	240° 45'.7	38'.5	224° 14'.4	11'.8	98° 48'.6	48'.7
04	327° 32'.9	216° 06'.1	23'.8	255° 46'.3	38'.8	239° 16'.2	11'.8	113° 51'.1	48'.7
05	342° 35'.4	231° 05'.3	23'.4	270° 46'.8	39'.0	254° 18'.1	11'.9	128° 53'.7	48'.7
06	357° 37'.9	246° 04'.5	23'.0	285° 47'.4	39'.3	269° 19'.9	11'.9	143° 56'.2	48'.7
07	12° 40'.3	261° 03'.7	22'.6	300° 48'.0	39'.5	284° 21'.8	11'.9	158° 58'.8	48'.7
08	27° 42'.8	276° 02'.8	22'.2	315° 48'.6	39'.8	299° 23'.6	11'.9	174° 01'.3	48'.7
09	42° 45'.3	291° 02'.0	21'.8	330° 49'.2	40'.0	314° 25'.4	11'.9	189° 03'.8	48'.6
10	57° 47'.7	306° 01'.2	21'.4	345° 49'.8	40'.2	329° 27'.3	11'.9	204° 06'.4	48'.6
11	72° 50'.2	321° 00'.4	21'.1	0° 50'.4	40'.5	344° 29'.1	11'.9	219° 08'.9	48'.6
12	87° 52'.6	335° 59'.5	23° 20'.7 N	15° 51'.0	22° 40'.7 N	359° 31'.0	23° 11'.9 N	234° 11'.5	10° 48'.6 S
13	102° 55'.1	350° 58'.7	20'.3	30° 51'.6	41'.0	14° 32'.8	11'.9	249° 14'.0	48'.6
14	117° 57'.6	5° 57'.9	19'.9	45° 52'.2	41'.2	29° 34'.6	12'.0	264° 16'.5	48'.6
15	133° 00'.0	20° 57'.1	19'.5	60° 52'.8	41'.4	44° 36'.5	12'.0	279° 19'.1	48'.6
16	148° 02'.5	35° 56'.3	19'.1	75° 53'.3	41'.7	59° 38'.3	12'.0	294° 21'.6	48'.5
17	163° 05'.0	50° 55'.4	18'.7	90° 53'.9	41'.9	74° 40'.2	12'.0	309° 24'.1	48'.5
18	178° 07'.4	65° 54'.6	18'.3	105° 54'.5	42'.2	89° 42'.0	12'.0	324° 26'.7	48'.5
19	193° 09'.9	80° 53'.8	17'.9	120° 55'.1	42'.4	104° 43'.8	12'.0	339° 29'.2	48'.5
20	208° 12'.4	95° 53'.0	17'.5	135° 55'.7	42'.6	119° 45'.7	12'.0	354° 31'.8	48'.5
21	223° 14'.8	110° 52'.2	17'.1	150° 56'.3	42'.9	134° 47'.5	12'.0	9° 34'.3	48'.5
22	238° 17'.3	125° 51'.3	16'.7	165° 56'.9	43'.1	149° 49'.4	12'.0	24° 36'.8	48'.4
23	253° 19'.8	140° 50'.5	16'.3	180° 57'.5	43'.3	164° 51'.2	12'.0	39° 39'.4	48'.4
20 Thursday 00	268° 22'.2	155° 49'.7	23° 15'.8 N	195° 58'.1	22° 43'.6 N	179° 53'.0	23° 12'.1 N	54° 41'.9	10° 48'.4 S
01	283° 24'.7	170° 48'.9	15'.4	210° 58'.7	43'.8	194° 54'.9	12'.1	69° 44'.4	48'.4
02	298° 27'.1	185° 48'.1	15'.0	225° 59'.3	44'.0	209° 56'.7	12'.1	84° 47'.0	48'.4
03	313° 29'.6	200° 47'.3	14'.6	240° 59'.9	44'.3	224° 58'.6	12'.1	99° 49'.5	48'.4
04	328° 32'.1	215° 46'.4	14'.2	256° 00'.4	44'.5	240° 00'.4	12'.1	114° 52'.1	48'.4
05	343° 34'.5	230° 45'.6	13'.8	271° 01'.0	44'.8	255° 02'.2	12'.1	129° 54'.6	48'.3
06	358° 37'.0	245° 44'.8	13'.4	286° 01'.6	45'.0	270° 04'.1	12'.1	144° 57'.1	48'.3
07	13° 39'.5	260° 44'.0	13'.0	301° 02'.2	45'.2	285° 05'.9	12'.1	159° 59'.7	48'.3
08	28° 41'.9	275° 43'.2	12'.5	316° 02'.8	45'.5	300° 07'.8	12'.1	175° 02'.2	48'.3
09	43° 44'.4	290° 42'.4	12'.1	331° 03'.4	45'.7	315° 09'.6	12'.1	190° 04'.7	48'.3
10	58° 46'.9	305° 41'.6	11'.7	346° 04'.0	45'.9	330° 11'.4	12'.2	205° 07'.3	48'.3
11	73° 49'.3	320° 40'.7	11'.3	1° 04'.6	46'.1	345° 13'.3	12'.2	220° 09'.8	48'.3
12	88° 51'.8	335° 39'.9	23° 10'.9 N	16° 05'.2	22° 46'.4 N	0° 15'.1	23° 12'.2 N	235° 12'.3	10° 48'.3 S
13	103° 54'.2	350° 39'.1	10'.4	31° 05'.8	46'.6	15° 17'.0	12'.2	250° 14'.9	48'.2
14	118° 56'.7	5° 38'.3	10'.0	46° 06'.4	46'.8	30° 18'.8	12'.2	265° 17'.4	48'.2
15	133° 59'.2	20° 37'.5	09'.6	61° 06'.9	47'.1	45° 20'.7	12'.2	280° 20'.0	48'.2
16	149° 01'.6	35° 36'.7	09'.2	76° 07'.5	47'.3	60° 22'.5	12'.2	295° 22'.5	48'.2
17	164° 04'.1	50° 35'.9	08'.7	91° 08'.1	47'.5	75° 24'.3	12'.2	310° 25'.0	48'.2
18	179° 06'.6	65° 35'.1	08'.3	106° 08'.7	47'.8	90° 26'.2	12'.2	325° 27'.6	48'.2
19	194° 09'.0	80° 34'.3	07'.9	121° 09'.3	48'.0	105° 28'.0	12'.2	340° 30'.1	48'.2
20	209° 11'.5	95° 33'.4	07'.4	136° 09'.9	48'.2	120° 29'.9	12'.2	355° 32'.6	48'.1
21	224° 14'.0	110° 32'.6	07'.0	151° 10'.5	48'.4	135° 31'.7	12'.3	10° 35'.2	48'.1
22	239° 16'.4	125° 31'.8	06'.6	166° 11'.1	48'.7	150° 33'.5	12'.3	25° 37'.7	48'.1
23	254° 18'.9	140° 31'.0	06'.1	181° 11'.7	48'.9	165° 35'.4	12'.3	40° 40'.2	48'.1
	M.P. 06:06	v -0'.8	d 0'.4	v 0'.6	d 0'.2	v 1'.8	d 0'.0	v 2'.5	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.7	40° 15'.0 S
Achernar	335° 27'.1	57° 09'.8 S
Acrux	173° 09'.1	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.7 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.6	55° 53'.4 N
Alkaid	152° 58'.7	49° 15'.0 N
Alnair	27° 43'.5	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.5	29° 09'.8 N
Altair	62° 07'.9	8° 54'.4 N
Ankaa	353° 15'.8	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.9 N
Atria	107° 27'.1	69° 03'.0 S
Avior	234° 18'.5	59° 33'.5 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.4 S
Capella	280° 34'.9	46° 00'.5 N
Deneb	49° 31'.1	45° 19'.7 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 56'.0	17° 54'.6 S
Dubhe	193° 51'.9	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.4 N
Enif	33° 46'.9	9° 56'.3 N
Fomalhaut	15° 23'.9	29° 32'.8 S
Gacrux	172° 00'.7	57° 11'.6 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.5 S
Hamal	328° 00'.9	23° 31'.4 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 19'.3	74° 06'.3 N
Markab	13° 38'.2	15° 16'.7 N
Menkar	314° 15'.3	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.2	69° 46'.7 S
Mirfak	308° 40'.7	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.8	56° 41'.1 S
Polaris	318° 04'.8	89° 19'.0 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.3 S
Rigil Kent	139° 51'.1	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.6	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.6 S
Vega	80° 38'.5	38° 47'.9 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	248° 46'.4	13:36
Mars	288° 20'.8	10:57
Jupiter	271° 45'.8	12:02
Saturn	146° 17'.9	20:22

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP
179° 44'.2	23° 24'.0 N	76° 01'.4	11'.3	7° 35'.2 S	10'.8	57'.8
194° 44'.1	24'.1	90° 31'.7	11'.2	46'.0	10'.7	
209° 43'.9	24'.1	105° 01'.9	11'.2	56'.7	10'.8	57'.9
224° 43'.8	24'.2	119° 32'.1	11'.1	8° 07'.5 S	10'.7	
239° 43'.7	24'.2	134° 02'.2	11'.0	18'.2	10'.6	
254° 43'.5	24'.3	148° 32'.2	11'.0	28'.8	10'.7	58'.0
269° 43'.4	24'.3	163° 02'.2	10'.9	39'.5	10'.6	
284° 43'.3	24'.4	177° 32'.1	10'.8	50'.1	10'.6	58'.1
299° 43'.1	24'.4	192° 01'.9	10'.7	9° 00'.7 S	10'.6	
314° 43'.0	24'.5	206° 31'.6	10'.6	11'.3	10'.5	
329° 42'.9	24'.5	221° 01'.2	10'.6	21'.8	10'.5	58'.2
344° 42'.7	24'.6	235° 30'.8	10'.5	32'.3	10'.4	
359° 42'.6	23° 24'.6 N	250° 00'.3	10'.4	9° 42'.7 S	10'.4	58'.3
14° 42'.5	24'.7	264° 29'.7	10'.3	53'.1	10'.4	
29° 42'.3	24'.7	278° 59'.0	10'.3	10° 03'.5 S	10'.3	
44° 42'.2	24'.7	293° 28'.3	10'.1	13'.8	10'.3	58'.4
59° 42'.0	24'.8	307° 57'.4	10'.1	24'.1	10'.3	
74° 41'.9	24'.8	322° 26'.5	10'.0	34'.4	10'.2	58'.5
89° 41'.8	24'.9	336° 55'.5	9'.9	44'.6	10'.1	
104° 41'.6	24'.9	351° 24'.4	9'.8	54'.7	10'.1	
119° 41'.5	25'.0	5° 53'.2	9'.7	11° 04'.8 S	10'.1	58'.6
134° 41'.4	25'.0	20° 21'.9	9'.7	14'.9	10'.0	
149° 41'.2	25'.0	34° 50'.6	9'.5	24'.9	10'.0	58'.7
164° 41'.1	25'.1	49° 19'.1	9'.5	34'.9	9'.9	
179° 41'.0	23° 25'.1 N	63° 47'.6	9'.4	11° 44'.8 S	9'.8	58'.7
194° 40'.8	25'.2	78° 16'.0	9'.3	54'.6	9'.8	58'.8
209° 40'.7	25'.2	92° 44'.3	9'.2	12° 04'.4 S	9'.8	
224° 40'.6	25'.2	107° 12'.5	9'.1	14'.2	9'.7	58'.9
239° 40'.4	25'.3	121° 40'.6	9'.0	23'.9	9'.6	
254° 40'.3	25'.3	136° 08'.6	9'.0	33'.5	9'.6	
269° 40'.1	25'.3	150° 36'.6	8'.8	43'.1	9'.5	59'.0
284° 40'.0	25'.4	165° 04'.4	8'.8	52'.6	9'.4	
299° 39'.9	25'.4	179° 32'.2	8'.6	13° 02'.0 S	9'.4	
314° 39'.7	25'.4	193° 59'.8	8'.6	11'.4	9'.3	59'.1
329° 39'.6	25'.5	208° 27'.4	8'.5	20'.7	9'.3	
344° 39'.5	25'.5	222° 54'.9	8'.3	30'.0	9'.2	59'.2
359° 39'.3	23° 25'.5 N	237° 22'.2	8'.3	13° 39'.2 S	9'.1	59'.2
14° 39'.2	25'.6	251° 49'.5	8'.2	48'.3	9'.0	
29° 39'.1	25'.6	266° 16'.7	8'.1	57'.3	9'.0	59'.3
44° 38'.9	25'.6	280° 43'.8	8'.0	14° 06'.3 S	8'.9	
59° 38'.8	25'.6	295° 10'.8	7'.9	15'.2	8'.8	59'.4
74° 38'.7	25'.7	309° 37'.7	7'.8	24'.0	8'.7	
89° 38'.5	25'.7	324° 04'.5	7'.8	32'.7	8'.7	
104° 38'.4	25'.7	338° 31'.3	7'.6	41'.4	8'.6	59'.5
119° 38'.2	25'.7	352° 57'.9	7'.5	50'.0	8'.5	
134° 38'.1	25'.8	7° 24'.4	7'.5	58'.5	8'.4	
149° 38'.0	25'.8	21° 50'.9	7'.3	15° 06'.9 S	8'.3	59'.6
164° 37'.8	25'.8	36° 17'.2	7'.2	15'.2	8'.3	
179° 37'.7	23° 25'.8 N	50° 43'.4	7'.2	15° 23'.5 S	8'.2	59'.7
194° 37'.6	25'.8	65° 09'.6	7'.1	31'.7	8'.0	
209° 37'.4	25'.9	79° 35'.7	6'.9	39'.7	8'.0	
224° 37'.3	25'.9	94° 01'.6	6'.9	47'.7	7'.9	59'.8
239° 37'.2	25'.9	108° 27'.5	6'.8	55'.6	7'.8	
254° 37'.0	25'.9	122° 53'.3	6'.7	16° 03'.4 S	7'.7	
269° 36'.9	25'.9	137° 19'.0	6'.5	11'.1	7'.6	59'.9
284° 36'.8	26'.0	151° 44'.5	6'.5	18'.7	7'.5	
299° 36'.6	26'.0	166° 10'.0	6'.4	26'.2	7'.5	
314° 36'.5	26'.0	180° 35'.4	6'.3	33'.7	7'.3	60'.0
329° 36'.3	26'.0	195° 00'.7	6'.3	41'.0	7'.2	
344° 36'.2	26'.0	209° 26'.0	6'.1	48'.2	7'.1	
359° 36'.1	23° 26'.0 N	223° 51'.1	6'.0	16° 55'.3 S	7'.0	60'.1
14° 35'.9	26'.0	238° 16'.1	6'.0	17° 02'.3 S	6'.9	
29° 35'.8	26'.1	252° 41'.1	5'.8	09'.2	6'.8	
44° 35'.7	26'.1	267° 05'.9	5'.8	16'.0	6'.7	60'.2
59° 35'.5	26'.1	281° 30'.7	5'.6	22'.7	6'.6	
74° 35'.4	26'.1	295° 55'.3	5'.6	29'.3	6'.4	
89° 35'.3	26'.1	310° 19'.9	5'.5	35'.7	6'.4	60'.3
104° 35'.1	26'.1	324° 44'.4	5'.4	42'.1	6'.2	
119° 35'.0	26'.1	339° 08'.8	5'.4	48'.3	6'.1	
134° 34'.9	26'.1	353° 33'.2	5'.2	54'.4	6'.0	60'.4
149° 34'.7	26'.1	7° 57'.4	5'.2	18° 00'.4 S	5'.9	
164° 34'.6	26'.1	22° 21'.6	5'.0	06'.3	5'.8	
SD 15'.7	d 0'.0	SD	15'.9	16'.1	16'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20
N 72°	-	-	-	15:47	17:59	-
N 70°	-	-	-	15:29	17:26	19:33
68°	-	-	-	15:15	17:02	18:52
66°	-	-	-	15:04	16:43	18:24
64°	-	-	01:31	14:54	16:28	18:03
62°	-	-	02:09	14:46	16:16	17:46
60°	-	00:49	02:36	14:39	16:05	17:32
N 58°	-	01:40	02:56	14:33	15:56	17:20
56°	-	02:10	03:13	14:28	15:48	17:10
54°	00:45	02:33	03:27	14:23	15:41	17:00
52°	01:32	02:51	03:39	14:18	15:35	16:52
50°	02:00	03:06	03:50	14:14	15:29	16:45
45°	02:46	03:35	04:13	14:06	15:17	16:29
N 40°	03:16	03:58	04:31	13:59	15:07	16:17
35°	03:40	04:16	04:46	13:53	14:58	16:06
30°	03:58	04:32	04:59	13:48	14:51	15:56
20°	04:27	04:57	05:21	13:39	14:38	15:40
N 10°	04:50	05:17	05:40	13:31	14:27	15:26
0°	05:09	05:35	05:58	13:23	14:16	15:13
S 10°	05:26	05:52	06:15	13:16	14:06	15:00
20°	05:42	06:10	06:34	13:08	13:55	14:46
30°	05:59	06:29	06:55	13:00	13:42	14:30
35°	06:07	06:39	07:07	12:55	13:35	14:21
40°	06:17	06:51	07:22	12:49	13:27	14:10
45°	06:27	07:04	07:38	12:42	13:17	13:58
S 50°	06:39	07:21	07:59	12:34	13:06	13:44
52°	06:44	07:28	08:09	12:31	13:00	13:37
54°	06:50	07:36	08:20	12:27	12:55	13:29
56°	06:56	07:45	08:33	12:23	12:48	13:21
58°	07:03	07:56	08:48	12:18	12:41	13:11
S 60°	07:10	08:07	09:05	12:12	12:33	13:00
S 62°	07:19	08:21	09:27	12:06	12:24	12:48

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 18	Moonset 19	Moonset 20
N 72°	-	-	-	23:04	22:43	-
N 70°	-	-	-	23:23	23:18	23:10
68°	-	-	-	23:39	23:43	23:52
66°	-	-	-	23:52	-	00:02
64°	22:32	-	-	-	00:02	00:18
62°	21:54	-	-	-	00:12	00:31
60°	21:27	23:14	-	00:01	00:19	00:42
N 58°	21:07	22:23	-	00:06	00:26	00:52
56°	20:50	21:53	-	00:10	00:32	01:01
54°	20:36	21:30	23:18	00:13	00:38	01:08
52°	20:23	21:12	22:31	00:16	00:43	01:15
50°	20:12	20:57	22:03	00:19	00:47	01:21
45°	19:50	20:27	21:17	00:25	00:57	01:35
N 40°	19:32	20:05	20:46	00:30	01:06	01:46
35°	19:17	19:46	20:23	00:35	01:13	01:55
30°	19:04	19:31	20:05	00:39	01:19	02:04
20°	18:42	19:06	19:35	00:46	01:30	02:18
N 10°	18:23	18:46	19:13	00:52	01:39	02:31
0°	18:05	18:28	18:54	00:57	01:48	02:43
S 10°	17:48	18:10	18:37	01:03	01:57	02:54
20°	17:29	17:53	18:21	01:09	02:07	03:07
30°	17:08	17:34	18:04	01:16	02:17	03:22
35°	16:55	17:24	17:55	01:20	02:24	03:30
40°	16:41	17:12	17:46	01:25	02:31	03:40
45°	16:24	16:58	17:36	01:30	02:39	03:51
S 50°	16:04	16:42	17:24	01:36	02:50	04:05
52°	15:54	16:35	17:18	01:39	02:54	04:11
54°	15:43	16:26	17:13	01:42	03:00	04:18
56°	15:30	16:17	17:07	01:46	03:05	04:26
58°	15:15	16:07	17:00	01:50	03:12	04:35
S 60°	14:58	15:55	16:52	01:54	03:19	04:46
S 62°	14:36	15:42	16:44	02:00	03:28	04:58

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
18	1 03	1 09	12:01	19:36	07:10	10d 69%
19	1 16	1 22	12:01	20:29	08:02	11d 79%
20	1 29	1 35	12:02	21:27	08:58	12d 87%

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2013 June 21, 22, 23 (Fri, Saty, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
21 Friday 00	269° 21'.4	155° 30'.2	23° 05'.7 N	196° 12'.3	22° 49'.1 N	180° 37'.2	23° 12'.3 N	55° 42'.8	10° 48'.1 S
01	284° 23'.8	170° 29'.4	05'.3	211° 12'.9	49'.4	195° 39'.1	12'.3	70° 45'.3	48'.1
02	299° 26'.3	185° 28'.6	04'.8	226° 13'.5	49'.6	210° 40'.9	12'.3	85° 47'.8	48'.1
03	314° 28'.7	200° 27'.8	04'.4	241° 14'.0	49'.8	225° 42'.7	12'.3	100° 50'.4	48'.0
04	329° 31'.2	215° 27'.0	04'.0	256° 14'.6	50'.0	240° 44'.6	12'.3	115° 52'.9	48'.0
05	344° 33'.7	230° 26'.2	03'.5	271° 15'.2	50'.3	255° 46'.4	12'.3	130° 55'.4	48'.0
06	359° 36'.1	245° 25'.4	03'.1	286° 15'.8	50'.5	270° 48'.3	12'.3	145° 58'.0	48'.0
07	14° 38'.6	260° 24'.6	02'.6	301° 16'.4	50'.7	285° 50'.1	12'.3	161° 00'.5	48'.0
08	29° 41'.1	275° 23'.8	02'.2	316° 17'.0	50'.9	300° 51'.9	12'.4	176° 03'.0	48'.0
09	44° 43'.5	290° 23'.0	01'.7	331° 17'.6	51'.2	315° 53'.8	12'.4	191° 05'.6	48'.0
10	59° 46'.0	305° 22'.2	01'.3	346° 18'.2	51'.4	330° 55'.6	12'.4	206° 08'.1	48'.0
11	74° 48'.5	320° 21'.4	00'.8	1° 18'.8	51'.6	345° 57'.5	12'.4	221° 10'.6	47'.9
12	89° 50'.9	335° 20'.6	23° 00'.4 N	16° 19'.4	22° 51'.8 N	0° 59'.3	23° 12'.4 N	236° 13'.2	10° 47'.9 S
13	104° 53'.4	350° 19'.7	22° 59'.9 N	31° 20'.0	52'.0	16° 01'.1	12'.4	251° 15'.7	47'.9
14	119° 55'.9	5° 18'.9	59'.5	46° 20'.5	52'.3	31° 03'.0	12'.4	266° 18'.2	47'.9
15	134° 58'.3	20° 18'.1	59'.0	61° 21'.1	52'.5	46° 04'.8	12'.4	281° 20'.7	47'.9
16	150° 00'.8	35° 17'.3	58'.6	76° 21'.7	52'.7	61° 06'.7	12'.4	296° 23'.3	47'.9
17	165° 03'.2	50° 16'.5	58'.1	91° 22'.3	52'.9	76° 08'.5	12'.4	311° 25'.8	47'.9
18	180° 05'.7	65° 15'.7	57'.7	106° 22'.9	53'.2	91° 10'.3	12'.4	326° 28'.3	47'.9
19	195° 08'.2	80° 14'.9	57'.2	121° 23'.5	53'.4	106° 12'.2	12'.4	341° 30'.9	47'.8
20	210° 10'.6	95° 14'.1	56'.8	136° 24'.1	53'.6	121° 14'.0	12'.5	356° 33'.4	47'.8
21	225° 13'.1	110° 13'.3	56'.3	151° 24'.7	53'.8	136° 15'.9	12'.5	11° 35'.9	47'.8
22	240° 15'.6	125° 12'.5	55'.8	166° 25'.3	54'.0	151° 17'.7	12'.5	26° 38'.5	47'.8
23	255° 18'.0	140° 11'.7	55'.4	181° 25'.9	54'.2	166° 19'.5	12'.5	41° 41'.0	47'.8
22 Saturday 00	270° 20'.5	155° 10'.9	22° 54'.9 N	196° 26'.5	22° 54'.5 N	181° 21'.4	23° 12'.5 N	56° 43'.5	10° 47'.8 S
01	285° 23'.0	170° 10'.2	54'.4	211° 27'.0	54'.7	196° 23'.2	12'.5	71° 46'.1	47'.8
02	300° 25'.4	185° 09'.4	54'.0	226° 27'.6	54'.9	211° 25'.1	12'.5	86° 48'.6	47'.8
03	315° 27'.9	200° 08'.6	53'.5	241° 28'.2	55'.1	226° 26'.9	12'.5	101° 51'.1	47'.8
04	330° 30'.4	215° 07'.8	53'.0	256° 28'.8	55'.3	241° 28'.7	12'.5	116° 53'.6	47'.7
05	345° 32'.8	230° 07'.0	52'.6	271° 29'.4	55'.5	256° 30'.6	12'.5	131° 56'.2	47'.7
06	0° 35'.3	245° 06'.2	52'.1	286° 30'.0	55'.8	271° 32'.4	12'.5	146° 58'.7	47'.7
07	15° 37'.7	260° 05'.4	51'.6	301° 30'.6	56'.0	286° 34'.3	12'.5	162° 01'.2	47'.7
08	30° 40'.2	275° 04'.6	51'.2	316° 31'.2	56'.2	301° 36'.1	12'.5	177° 03'.8	47'.7
09	45° 42'.7	290° 03'.8	50'.7	331° 31'.8	56'.4	316° 37'.9	12'.6	192° 06'.3	47'.7
10	60° 45'.1	305° 03'.0	50'.2	346° 32'.4	56'.6	331° 39'.8	12'.6	207° 08'.8	47'.7
11	75° 47'.6	320° 02'.2	49'.7	1° 33'.0	56'.8	346° 41'.6	12'.6	222° 11'.3	47'.7
12	90° 50'.1	335° 01'.4	22° 49'.3 N	16° 33'.5	22° 57'.1 N	1° 43'.5	23° 12'.6 N	237° 13'.9	10° 47'.7 S
13	105° 52'.5	350° 00'.6	48'.8	31° 34'.1	57'.3	16° 45'.3	12'.6	252° 16'.4	47'.6
14	120° 55'.0	4° 59'.8	48'.3	46° 34'.7	57'.5	31° 47'.1	12'.6	267° 18'.9	47'.6
15	135° 57'.5	19° 59'.0	47'.8	61° 35'.3	57'.7	46° 49'.0	12'.6	282° 21'.5	47'.6
16	150° 59'.9	34° 58'.2	47'.3	76° 35'.9	57'.9	61° 50'.8	12'.6	297° 24'.0	47'.6
17	166° 02'.4	49° 57'.5	46'.9	91° 36'.5	58'.1	76° 52'.7	12'.6	312° 26'.5	47'.6
18	181° 04'.9	64° 56'.7	46'.4	106° 37'.1	58'.3	91° 54'.5	12'.6	327° 29'.0	47'.6
19	196° 07'.3	79° 55'.9	45'.9	121° 37'.7	58'.5	106° 56'.3	12'.6	342° 31'.6	47'.6
20	211° 09'.8	94° 55'.1	45'.4	136° 38'.3	58'.7	121° 58'.2	12'.6	357° 34'.1	47'.6
21	226° 12'.2	109° 54'.3	44'.9	151° 38'.9	59'.0	137° 00'.0	12'.6	12° 36'.6	47'.6
22	241° 14'.7	124° 53'.5	44'.4	166° 39'.5	59'.2	152° 01'.9	12'.7	27° 39'.1	47'.5
23	256° 17'.2	139° 52'.7	43'.9	181° 40'.1	59'.4	167° 03'.7	12'.7	42° 41'.7	47'.5
23 Sunday 00	271° 19'.6	154° 51'.9	22° 43'.5 N	196° 40'.6	22° 59'.6 N	182° 05'.5	23° 12'.7 N	57° 44'.2	10° 47'.5 S
01	286° 22'.1	169° 51'.1	43'.0	211° 41'.2	59'.8	197° 07'.4	12'.7	72° 46'.7	47'.5
02	301° 24'.6	184° 50'.4	42'.5	226° 41'.8	23° 00'.0 N	212° 09'.2	12'.7	87° 49'.3	47'.5
03	316° 27'.0	199° 49'.6	42'.0	241° 42'.4	00'.2	227° 11'.1	12'.7	102° 51'.8	47'.5
04	331° 29'.5	214° 48'.8	41'.5	256° 43'.0	00'.4	242° 12'.9	12'.7	117° 54'.3	47'.5
05	346° 32'.0	229° 48'.0	41'.0	271° 43'.6	00'.6	257° 14'.7	12'.7	132° 56'.8	47'.5
06	1° 34'.4	244° 47'.2	40'.5	286° 44'.2	00'.8	272° 16'.6	12'.7	147° 59'.4	47'.5
07	16° 36'.9	259° 46'.4	40'.0	301° 44'.8	01'.0	287° 18'.4	12'.7	163° 01'.9	47'.4
08	31° 39'.4	274° 45'.6	39'.5	316° 45'.4	01'.2	302° 20'.3	12'.7	178° 04'.4	47'.4
09	46° 41'.8	289° 44'.9	39'.0	331° 46'.0	01'.5	317° 22'.1	12'.7	193° 06'.9	47'.4
10	61° 44'.3	304° 44'.1	38'.5	346° 46'.6	01'.7	332° 24'.0	12'.7	208° 09'.5	47'.4
11	76° 46'.7	319° 43'.3	38'.0	1° 47'.1	01'.9	347° 25'.8	12'.7	223° 12'.0	47'.4
12	91° 49'.2	334° 42'.5	22° 37'.5 N	16° 47'.7	23° 02'.1 N	2° 27'.6	23° 12'.7 N	238° 14'.5	10° 47'.4 S
13	106° 51'.7	349° 41'.7	37'.0	31° 48'.3	02'.3	17° 29'.5	12'.8	253° 17'.0	47'.4
14	121° 54'.1	4° 41'.0	36'.5	46° 48'.9	02'.5	32° 31'.3	12'.8	268° 19'.6	47'.4
15	136° 56'.6	19° 40'.2	36'.0	61° 49'.5	02'.7	47° 33'.2	12'.8	283° 22'.1	47'.4
16	151° 59'.1	34° 39'.4	35'.5	76° 50'.1	02'.9	62° 35'.0	12'.8	298° 24'.6	47'.4
17	167° 01'.5	49° 38'.6	35'.0	91° 50'.7	03'.1	77° 36'.8	12'.8	313° 27'.1	47'.4
18	182° 04'.0	64° 37'.8	34'.4	106° 51'.3	03'.3	92° 38'.7	12'.8	328° 29'.7	47'.3
19	197° 06'.5	79° 37'.1	33'.9	121° 51'.9	03'.5	107° 40'.5	12'.8	343° 32'.2	47'.3
20	212° 08'.9	94° 36'.3	33'.4	136° 52'.5	03'.7	122° 42'.4	12'.8	358° 34'.7	47'.3
21	227° 11'.4	109° 35'.5	32'.9	151° 53'.1	03'.9	137° 44'.2	12'.8	13° 37'.2	47'.3
22	242° 13'.8	124° 34'.7	32'.4	166° 53'.6	04'.1	152° 46'.0	12'.8	28° 39'.7	47'.3
23	257° 16'.3	139° 33'.9	31'.9	181° 54'.2	04'.3	167° 47'.9	12'.8	43° 42'.3	47'.3
	M.P. 05:54	v -0'.8	d 0'.5	v 0'.6	d 0'.2	v 1'.8	d 0'.0	v 2'.5	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.7	40° 14'.9 S
Achernar	335° 27'.1	57° 09'.8 S
Acrux	173° 09'.1	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.6 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.6	55° 53'.4 N
Alkaid	152° 58'.7	49° 15'.0 N
Alnair	27° 43'.5	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.3 N
Alpheratz	357° 43'.4	29° 09'.8 N
Altair	62° 07'.9	8° 54'.4 N
Ankaa	353° 15'.8	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.9 N
Atria	107° 27'.1	69° 03'.0 S
Avior	234° 18'.5	59° 33'.5 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.4 S
Capella	280° 34'.9	46° 00'.5 N
Deneb	49° 31'.1	45° 19'.7 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.9	17° 54'.6 S
Dubhe	193° 51'.9	61° 40'.9 N
Elnath	278° 13'.0	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.4 N
Enif	33° 46'.9	9° 56'.3 N
Fomalhaut	15° 23'.9	29° 32'.8 S
Gacrux	172° 00'.7	57° 11'.7 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.5 S
Hamal	328° 00'.9	23° 31'.4 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 19'.3	74° 06'.3 N
Markab	13° 38'.2	15° 16'.7 N
Menkar	314° 15'.3	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.2	69° 46'.7 S
Mirfak	308° 40'.7	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.7	56° 41'.1 S
Polaris	318° 03'.4	89° 19'.0 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.3 S
Rigil Kent	139° 51'.1	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.5	56° 36'.4 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.6 S
Vega	80° 38'.5	38° 47'.9 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	244° 50'.5	13:40
Mars	286° 06'.0	10:54
Jupiter	271° 00'.9	11:53
Saturn	146° 23'.0	20:10

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
179° 34'.5	23° 26'.1 N	36° 45'.6	5'.0	18° 12'.1 S	5'.6	60'.5
194° 34'.3	26'.1	51° 09'.6	4'.9	17'.7	5'.5	
209° 34'.2	26'.1	65° 33'.5	4'.8	23'.2	5'.4	
224° 34'.0	26'.1	79° 57'.3	4'.8	28'.6	5'.3	60'.6
239° 33'.9	26'.1	94° 21'.1	4'.7	33'.9	5'.1	
254° 33'.8	26'.1	108° 44'.8	4'.6	39'.0	5'.0	
269° 33'.6	26'.1	123° 08'.4	4'.5	44'.0	4'.9	
284° 33'.5	26'.1	137° 31'.9	4'.4	48'.9	4'.8	60'.7
299° 33'.4	26'.1	151° 55'.3	4'.4	53'.7	4'.6	
314° 33'.2	26'.1	166° 18'.7	4'.3	58'.3	4'.5	
329° 33'.1	26'.1	180° 42'.0	4'.2	19° 02'.8 S	4'.4	
344° 33'.0	26'.1	195° 05'.2	4'.2	07'.2	4'.2	60'.8
359° 32'.8	23° 26'.1 N	209° 28'.4	4'.0	19° 11'.4 S	4'.1	60'.8
14° 32'.7	26'.1	223° 51'.4	4'.1	15'.5	3'.9	
29° 32'.6	26'.1	238° 14'.5	3'.9	19'.4	3'.8	
44° 32'.4	26'.1	252° 37'.4	3'.9	23'.2	3'.7	60'.9
59° 32'.3	26'.1	267° 00'.3	3'.8	26'.9	3'.6	
74° 32'.2	26'.1	281° 23'.1	3'.8	30'.5	3'.4	
89° 32'.0	26'.1	295° 45'.9	3'.7	33'.9	3'.2	
104° 31'.9	26'.1	310° 08'.6	3'.7	37'.1	3'.1	61'.0
119° 31'.8	26'.1	324° 31'.3	3'.6	40'.2	3'.0	
134° 31'.6	26'.0	338° 53'.9	3'.5	43'.2	2'.8	
149° 31'.5	26'.0	353° 16'.4	3'.5	46'.0	2'.7	
164° 31'.3	26'.0	7° 38'.9	3'.5	48'.7	2'.5	
179° 31'.2	23° 26'.0 N	22° 01'.4	3'.3	19° 51'.2 S	2'.4	61'.1
194° 31'.1	26'.0	36° 23'.7	3'.4	53'.6	2'.2	
209° 30'.9	26'.0	50° 46'.1	3'.3	55'.8	2'.1	
224° 30'.8	26'.0	65° 08'.4	3'.3	57'.9	1'.9	
239° 30'.7	25'.9	79° 30'.7	3'.2	59'.8	1'.8	
254° 30'.5	25'.9	93° 52'.9	3'.2	20° 01'.6 S	1'.7	61'.2
269° 30'.4	25'.9	108° 15'.1	3'.1	03'.3	1'.5	
284° 30'.3	25'.9	122° 37'.2	3'.1	04'.8	1'.3	
299° 30'.1	25'.9	136° 59'.3	3'.1	06'.1	1'.2	
314° 30'.0	25'.9	151° 21'.4	3'.0	07'.3	1'.0	
329° 29'.9	25'.8	165° 43'.4	3'.1	08'.3	0'.9	
344° 29'.7	25'.8	180° 05'.5	3'.0	09'.2	0'.7	61'.3
359° 29'.6	23° 25'.8 N	194° 27'.5	2'.9	20° 09'.9 S	0'.6	61'.3
14° 29'.5	25'.8	208° 49'.4	3'.0	10'.5	0'.4	
29° 29'.3	25'.7	223° 11'.4	2'.9	10'.9	0'.3	
44° 29'.2	25'.7	237° 33'.3	2'.9	11'.2	0'.1	
59° 29'.1	25'.7	251° 55'.2	2'.9	11'.3	0'.1	
74° 28'.9	25'.7	266° 17'.1	2'.9	11'.2	0'.2	
89° 28'.8	25'.6	280° 39'.0	2'.8	11'.0	0'.3	
104° 28'.7	25'.6	295° 00'.8	2'.9	10'.7	0'.6	
119° 28'.5	25'.6	309° 22'.7	2'.8	10'.1	0'.6	61'.4
134° 28'.4	25'.6	323° 44'.5	2'.9	09'.5	0'.9	
149° 28'.3	25'.5	338° 06'.4	2'.8	08'.6	0'.9	
164° 28'.1	25'.5	352° 28'.2	2'.8	07'.7	1'.2	
179° 28'.0	23° 25'.5 N	6° 50'.0	2'.9	20° 06'.5 S	1'.2	61'.4
194° 27'.9	25'.4	21° 11'.9	2'.8	05'.3	1'.5	
209° 27'.7	25'.4	35° 33'.7	2'.9	03'.8	1'.6	
224° 27'.6	25'.4	49° 55'.6	2'.8	02'.2	1'.7	
239° 27'.5	25'.3	64° 17'.4	2'.9	00'.5	1'.9	
254° 27'.3	25'.3	78° 39'.3	2'.9	19° 58'.6 S	2'.1	
269° 27'.2	25'.3	93° 01'.2	2'.9	56'.5	2'.2	
284° 27'.1	25'.2	107° 23'.1	2'.9	54'.3	2'.4	
299° 26'.9	25'.2	121° 45'.0	2'.9	51'.9	2'.5	
314° 26'.8	25'.2	136° 06'.9	2'.9	49'.4	2'.7	
329° 26'.7	25'.1	150° 28'.8	3'.0	46'.7	2'.8	
344° 26'.5	25'.1	164° 50'.8	3'.0	43'.9	3'.0	
359° 26'.4	23° 25'.1 N	179° 12'.8	3'.0	19° 40'.9 S	3'.1	61'.4
14° 26'.3	25'.0	193° 34'.8	3'.1	37'.8	3'.3	
29° 26'.1	25'.0	207° 56'.9	3'.0	34'.5	3'.4	
44° 26'.0	24'.9	222° 18'.9	3'.2	31'.1	3'.6	
59° 25'.9	24'.9	236° 41'.1	3'.1	27'.5	3'.7	
74° 25'.7	24'.8	251° 03'.2	3'.2	23'.8	3'.9	
89° 25'.6	24'.8	265° 25'.4	3'.2	19'.9	4'.0	
104° 25'.4	24'.8	279° 47'.6	3'.2	15'.9	4'.1	
119° 25'.3	24'.7	294° 09'.8	3'.3	11'.8	4'.3	
134° 25'.2	24'.7	308° 32'.1	3'.4	07'.5	4'.5	
149° 25'.1	24'.6	322° 54'.5	3'.4	03'.0	4'.6	
164° 24'.9	24'.6	337° 16'.9	3'.4	18° 58'.4 S	4'.7	
SD 15'.7	d 0'.0	SD	16'.6	16'.7	16'.7	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23
N 72°	-	-	-	-	-	-
N 70°	-	-	-	22:10	-	23:21
68°	-	-	-	20:37	21:53	22:28
66°	-	-	-	19:59	21:11	21:55
64°	-	-	01:31	19:31	20:42	21:30
62°	-	-	02:10	19:10	20:20	21:11
60°	-	00:49	02:36	18:53	20:03	20:55
N 58°	-	01:41	02:57	18:39	19:48	20:42
56°	-	02:11	03:13	18:27	19:35	20:30
54°	00:45	02:33	03:28	18:16	19:24	20:20
52°	01:33	02:51	03:40	18:07	19:14	20:11
50°	02:01	03:06	03:51	17:58	19:05	20:03
45°	02:46	03:36	04:13	17:40	18:47	19:45
N 40°	03:17	03:59	04:32	17:26	18:32	19:31
35°	03:40	04:17	04:47	17:13	18:19	19:19
30°	03:59	04:32	05:00	17:03	18:08	19:09
20°	04:28	04:57	05:22	16:44	17:48	18:50
N 10°	04:51	05:18	05:41	16:28	17:32	18:35
0°	05:10	05:36	05:58	16:13	17:16	18:20
S 10°	05:27	05:53	06:16	15:58	17:01	18:05
20°	05:43	06:10	06:34	15:43	16:44	17:49
30°	05:59	06:29	06:56	15:24	16:25	17:31
35°	06:08	06:40	07:08	15:14	16:14	17:21
40°	06:18	06:52	07:22	15:02	16:02	17:08
45°	06:28	07:05	07:39	14:48	15:47	16:54
S 50°	06:40	07:21	08:00	14:31	15:28	16:37
52°	06:45	07:29	08:10	14:22	15:20	16:28
54°	06:51	07:37	08:21	14:13	15:10	16:19
56°	06:57	07:46	08:34	14:03	14:59	16:09
58°	07:04	07:56	08:48	13:52	14:47	15:57
S 60°	07:11	08:08	09:06	13:39	14:32	15:43
S 62°	07:20	08:22	09:28	13:23	14:15	15:27

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 21	Moonset 22	Moonset 23
N 72°	-	-	-	-	-	-
N 70°	-	-	-	22:41	-	25:57
68°	-	-	-	-	00:14	01:12
66°	-	-	-	00:20	00:54	01:54
64°	22:32	-	-	00:42	01:21	02:22
62°	21:54	-	-	01:00	01:42	02:44
60°	21:28	23:14	-	01:14	01:59	03:02
N 58°	21:07	22:23	-	01:27	02:14	03:16
56°	20:51	21:53	-	01:38	02:26	03:29
54°	20:36	21:31	23:18	01:47	02:37	03:40
52°	20:24	21:13	22:31	01:56	02:47	03:50
50°	20:13	20:58	22:03	02:03	02:55	03:59
45°	19:51	20:28	21:18	02:20	03:14	04:17
N 40°	19:32	20:05	20:47	02:33	03:29	04:32
35°	19:17	19:47	20:24	02:45	03:41	04:45
30°	19:04	19:32	20:05	02:55	03:52	04:56
20°	18:42	19:07	19:36	03:12	04:11	05:15
N 10°	18:23	18:46	19:13	03:27	04:28	05:31
0°	18:06	18:28	18:54	03:41	04:43	05:47
S 10°	17:48	18:11	18:37	03:55	04:58	06:02
20°	17:30	17:54	18:21	04:10	05:15	06:18
30°	17:08	17:35	18:05	04:28	05:34	06:37
35°	16:56	17:24	17:56	04:38	05:45	06:48
40°	16:42	17:12	17:47	04:49	05:57	07:00
45°	16:25	16:59	17:36	05:03	06:12	07:15
S 50°	16:04	16:43	17:24	05:20	06:30	07:33
52°	15:54	16:35	17:19	05:27	06:39	07:41
54°	15:43	16:27	17:13	05:36	06:48	07:50
56°	15:31	16:18	17:07	05:46	06:59	08:01
58°	15:16	16:08	17:00	05:57	07:12	08:13
S 60°	14:58	15:56	16:53	06:10	07:26	08:27
S 62°	14:37	15:42	16:44	06:25	07:43	08:44

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
21	1 42	1 48	12:02	22:28	09:57	13d 94%
22	1 55	2 01	12:02	23:31	11:00	14d 98%
23	2 08	2 14	12:02	24:35	12:03	15d Full

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2013 June 24, 25, 26 (Mon, Tue, Wed)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
24 Monday 00	272° 18'.8	154° 33'.2	22° 31'.4 N	196° 54'.8	23° 04'.5 N	182° 49'.7	23° 12'.8 N	58° 44'.8	10° 47'.3 S
01	287° 21'.2	169° 32'.4	30'.8	211° 55'.4	04'.7	197° 51'.6	12'.8	73° 47'.3	47'.3
02	302° 23'.7	184° 31'.6	30'.3	226° 56'.0	04'.9	212° 53'.4	12'.8	88° 49'.8	47'.3
03	317° 26'.2	199° 30'.8	29'.8	241° 56'.6	05'.1	227° 55'.2	12'.8	103° 52'.4	47'.3
04	332° 28'.6	214° 30'.1	29'.3	256° 57'.2	05'.3	242° 57'.1	12'.8	118° 54'.9	47'.3
05	347° 31'.1	229° 29'.3	28'.8	271° 57'.8	05'.5	257° 58'.9	12'.8	133° 57'.4	47'.2
06	2° 33'.6	244° 28'.5	28'.2	286° 58'.4	05'.7	273° 00'.8	12'.9	148° 59'.9	47'.2
07	17° 36'.0	259° 27'.7	27'.7	301° 59'.0	05'.9	288° 02'.6	12'.9	164° 02'.4	47'.2
08	32° 38'.5	274° 27'.0	27'.2	316° 59'.6	06'.1	303° 04'.4	12'.9	179° 05'.0	47'.2
09	47° 41'.0	289° 26'.2	26'.7	332° 00'.1	06'.3	318° 06'.3	12'.9	194° 07'.5	47'.2
10	62° 43'.4	304° 25'.4	26'.1	347° 00'.7	06'.5	333° 08'.1	12'.9	209° 10'.0	47'.2
11	77° 45'.9	319° 24'.7	25'.6	2° 01'.3	06'.7	348° 10'.0	12'.9	224° 12'.5	47'.2
12	92° 48'.3	334° 23'.9	22° 25'.1 N	17° 01'.9	23° 06'.9 N	3° 11'.8	23° 12'.9 N	239° 15'.1	10° 47'.2 S
13	107° 50'.8	349° 23'.1	24'.5	32° 02'.5	07'.1	18° 13'.7	12'.9	254° 17'.6	47'.2
14	122° 53'.3	4° 22'.3	24'.0	47° 03'.1	07'.3	33° 15'.5	12'.9	269° 20'.1	47'.2
15	137° 55'.7	19° 21'.6	23'.5	62° 03'.7	07'.5	48° 17'.3	12'.9	284° 22'.6	47'.2
16	152° 58'.2	34° 20'.8	22'.9	77° 04'.3	07'.6	63° 19'.2	12'.9	299° 25'.1	47'.1
17	168° 00'.7	49° 20'.0	22'.4	92° 04'.9	07'.8	78° 21'.0	12'.9	314° 27'.7	47'.1
18	183° 03'.1	64° 19'.3	21'.9	107° 05'.5	08'.0	93° 22'.9	12'.9	329° 30'.2	47'.1
19	198° 05'.6	79° 18'.5	21'.3	122° 06'.1	08'.2	108° 24'.7	12'.9	344° 32'.7	47'.1
20	213° 08'.1	94° 17'.7	20'.8	137° 06'.7	08'.4	123° 26'.5	12'.9	359° 35'.2	47'.1
21	228° 10'.5	109° 17'.0	20'.2	152° 07'.2	08'.6	138° 28'.4	12'.9	14° 37'.7	47'.1
22	243° 13'.0	124° 16'.2	19'.7	167° 07'.8	08'.8	153° 30'.2	12'.9	29° 40'.3	47'.1
23	258° 15'.5	139° 15'.4	19'.2	182° 08'.4	09'.0	168° 32'.1	12'.9	44° 42'.8	47'.1
25 Tuesday 00	273° 17'.9	154° 14'.7	22° 18'.6 N	197° 09'.0	23° 09'.2 N	183° 33'.9	23° 13'.0 N	59° 45'.3	10° 47'.1 S
01	288° 20'.4	169° 13'.9	18'.1	212° 09'.6	09'.4	198° 35'.7	13'.0	74° 47'.8	47'.1
02	303° 22'.8	184° 13'.1	17'.5	227° 10'.2	09'.6	213° 37'.6	13'.0	89° 50'.3	47'.1
03	318° 25'.3	199° 12'.4	17'.0	242° 10'.8	09'.8	228° 39'.4	13'.0	104° 52'.8	47'.1
04	333° 27'.8	214° 11'.6	16'.4	257° 11'.4	09'.9	243° 41'.3	13'.0	119° 55'.4	47'.1
05	348° 30'.2	229° 10'.8	15'.9	272° 12'.0	10'.1	258° 43'.1	13'.0	134° 57'.9	47'.0
06	3° 32'.7	244° 10'.1	15'.3	287° 12'.6	10'.3	273° 45'.0	13'.0	150° 00'.4	47'.0
07	18° 35'.2	259° 09'.3	14'.8	302° 13'.2	10'.5	288° 46'.8	13'.0	165° 02'.9	47'.0
08	33° 37'.6	274° 08'.6	14'.2	317° 13'.7	10'.7	303° 48'.6	13'.0	180° 05'.4	47'.0
09	48° 40'.1	289° 07'.8	13'.7	332° 14'.3	10'.9	318° 50'.5	13'.0	195° 08'.0	47'.0
10	63° 42'.6	304° 07'.0	13'.1	347° 14'.9	11'.1	333° 52'.3	13'.0	210° 10'.5	47'.0
11	78° 45'.0	319° 06'.3	12'.6	2° 15'.5	11'.3	348° 54'.2	13'.0	225° 13'.0	47'.0
12	93° 47'.5	334° 05'.5	22° 12'.0 N	17° 16'.1	23° 11'.5 N	3° 56'.0	23° 13'.0 N	240° 15'.5	10° 47'.0 S
13	108° 50'.0	349° 04'.8	11'.4	32° 16'.7	11'.6	18° 57'.8	13'.0	255° 18'.0	47'.0
14	123° 52'.4	4° 04'.0	10'.9	47° 17'.3	11'.8	33° 59'.7	13'.0	270° 20'.5	47'.0
15	138° 54'.9	19° 03'.2	10'.3	62° 17'.9	12'.0	49° 01'.5	13'.0	285° 23'.1	47'.0
16	153° 57'.3	34° 02'.5	09'.8	77° 18'.5	12'.2	64° 03'.4	13'.0	300° 25'.6	47'.0
17	168° 59'.8	49° 01'.7	09'.2	92° 19'.1	12'.4	79° 05'.2	13'.0	315° 28'.1	47'.0
18	184° 02'.3	64° 01'.0	08'.6	107° 19'.7	12'.6	94° 07'.0	13'.0	330° 30'.6	47'.0
19	199° 04'.7	79° 00'.2	08'.1	122° 20'.3	12'.8	109° 08'.9	13'.0	345° 33'.1	46'.9
20	214° 07'.2	93° 59'.5	07'.5	137° 20'.8	12'.9	124° 10'.7	13'.0	0° 35'.6	46'.9
21	229° 09'.7	108° 58'.7	06'.9	152° 21'.4	13'.1	139° 12'.6	13'.0	15° 38'.2	46'.9
22	244° 12'.1	123° 57'.9	06'.4	167° 22'.0	13'.3	154° 14'.4	13'.1	30° 40'.7	46'.9
23	259° 14'.6	138° 57'.2	05'.8	182° 22'.6	13'.5	169° 16'.3	13'.1	45° 43'.2	46'.9
26 Wednesday 00	274° 17'.1	153° 56'.4	22° 05'.2 N	197° 23'.2	23° 13'.7 N	184° 18'.1	23° 13'.1 N	60° 45'.7	10° 46'.9 S
01	289° 19'.5	168° 55'.7	04'.7	212° 23'.8	13'.8	199° 19'.9	13'.1	75° 48'.2	46'.9
02	304° 22'.0	183° 54'.9	04'.1	227° 24'.4	14'.0	214° 21'.8	13'.1	90° 50'.7	46'.9
03	319° 24'.5	198° 54'.2	03'.5	242° 25'.0	14'.2	229° 23'.6	13'.1	105° 53'.2	46'.9
04	334° 26'.9	213° 53'.4	03'.0	257° 25'.6	14'.4	244° 25'.5	13'.1	120° 55'.8	46'.9
05	349° 29'.4	228° 52'.7	02'.4	272° 26'.2	14'.6	259° 27'.3	13'.1	135° 58'.3	46'.9
06	4° 31'.8	243° 51'.9	01'.8	287° 26'.8	14'.8	274° 29'.1	13'.1	151° 00'.8	46'.9
07	19° 34'.3	258° 51'.2	01'.2	302° 27'.3	14'.9	289° 31'.0	13'.1	166° 03'.3	46'.9
08	34° 36'.8	273° 50'.4	00'.6	317° 27'.9	15'.1	304° 32'.8	13'.1	181° 05'.8	46'.9
09	49° 39'.2	288° 49'.7	00'.1	332° 28'.5	15'.3	319° 34'.7	13'.1	196° 08'.3	46'.9
10	64° 41'.7	303° 48'.9	21° 59'.5 N	347° 29'.1	15'.5	334° 36'.5	13'.1	211° 10'.8	46'.9
11	79° 44'.2	318° 48'.2	58'.9	2° 29'.7	15'.6	349° 38'.4	13'.1	226° 13'.4	46'.8
12	94° 46'.6	333° 47'.4	21° 58'.3 N	17° 30'.3	23° 15'.8 N	4° 40'.2	23° 13'.1 N	241° 15'.9	10° 46'.8 S
13	109° 49'.1	348° 46'.7	57'.7	32° 30'.9	16'.0	19° 42'.0	13'.1	256° 18'.4	46'.8
14	124° 51'.6	3° 45'.9	57'.2	47° 31'.5	16'.2	34° 43'.9	13'.1	271° 20'.9	46'.8
15	139° 54'.0	18° 45'.2	56'.6	62° 32'.1	16'.4	49° 45'.7	13'.1	286° 23'.4	46'.8
16	154° 56'.5	33° 44'.4	56'.0	77° 32'.7	16'.5	64° 47'.6	13'.1	301° 25'.9	46'.8
17	169° 58'.9	48° 43'.7	55'.4	92° 33'.3	16'.7	79° 49'.4	13'.1	316° 28'.4	46'.8
18	185° 01'.4	63° 43'.0	54'.8	107° 33'.9	16'.9	94° 51'.2	13'.1	331° 30'.9	46'.8
19	200° 03'.9	78° 42'.2	54'.2	122° 34'.4	17'.1	109° 53'.1	13'.1	346° 33'.5	46'.8
20	215° 06'.3	93° 41'.5	53'.6	137° 35'.0	17'.2	124° 54'.9	13'.1	1° 36'.0	46'.8
21	230° 08'.8	108° 40'.7	53'.0	152° 35'.6	17'.4	139° 56'.8	13'.1	16° 38'.5	46'.8
22	245° 11'.3	123° 40'.0	52'.4	167° 36'.2	17'.6	154° 58'.6	13'.1	31° 41'.0	46'.8
23	260° 13'.7	138° 39'.2	51'.8	182° 36'.8	17'.8	170° 00'.5	13'.1	46° 43'.5	46'.8
	M.P. 05:42	v -0'.8	d 0'.6	v 0'.6	d 0'.2	v 1'.8	d 0'.0	v 2'.5	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.6	40° 14'.9 S
Achernar	335° 27'.0	57° 09'.8 S
Acrux	173° 09'.1	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.6 S
Aldebaran	290° 49'.7	16° 32'.0 N
Alioth	166° 20'.6	55° 53'.4 N
Alkaid	152° 58'.7	49° 15'.0 N
Alnair	27° 43'.5	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.8 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.4 N
Alpheratz	357° 43'.4	29° 09'.8 N
Altair	62° 07'.9	8° 54'.4 N
Ankaa	353° 15'.7	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.9 N
Atria	107° 27'.1	69° 03'.1 S
Avior	234° 18'.5	59° 33'.5 S
Bellatrix	278° 32'.3	6° 21'.5 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.3 S
Capella	280° 34'.9	46° 00'.5 N
Deneb	49° 31'.0	45° 19'.7 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.9	17° 54'.6 S
Dubhe	193° 52'.0	61° 40'.9 N
Elnath	278° 12'.9	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.4 N
Enif	33° 46'.9	9° 56'.3 N
Fomalhaut	15° 23'.8	29° 32'.8 S
Gacrux	172° 00'.7	57° 11'.7 S
Gienah	175° 52'.2	17° 37'.2 S
Hadar	148° 47'.4	60° 26'.5 S
Hamal	328° 00'.9	23° 31'.4 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 19'.4	74° 06'.3 N
Markab	13° 38'.2	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.3	69° 46'.7 S
Mirfak	308° 40'.6	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.7	56° 41'.1 S
Polaris	318° 02'.1	89° 19'.0 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.2 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.4	8° 11'.3 S
Rigil Kent	139° 51'.1	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.4 S
Schedar	349° 40'.5	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.5 S
Vega	80° 38'.5	38° 47'.9 N
Zuben'ubi	137° 05'.1	16° 05'.9 S

	SHA	Mer.Pass.
Venus	240° 56'.7	13:44
Mars	283° 51'.1	10:51
Jupiter	270° 16'.0	11:44
Saturn	146° 27'.4	19:58

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
24 00	179° 24'.8	23° 24'.5 N	351° 39'.3	3'.5	18° 53'.7 S	4'.9	61'.4
01	194° 24'.7	24'.5	6° 01'.8	3'.5	48'.8	5'.0	
02	209° 24'.5	24'.4	20° 24'.3	3'.6	43'.8	5'.2	
03	224° 24'.4	24'.4	34° 46'.9	3'.7	38'.6	5'.2	61'.3
04	239° 24'.3	24'.3	49° 09'.6	3'.6	33'.4	5'.5	
05	254° 24'.1	24'.3	63° 32'.2	3'.8	27'.9	5'.5	
06	269° 24'.0	24'.2	77° 55'.0	3'.8	22'.4	5'.7	
07	284° 23'.9	24'.2	92° 17'.8	3'.9	16'.7	5'.9	
08	299° 23'.7	24'.1	106° 40'.7	3'.9	10'.8	5'.9	
09	314° 23'.6	24'.1	121° 03'.6	4'.0	04'.9	6'.1	
10	329° 23'.5	24'.0	135° 26'.6	4'.1	17° 58'.8 S	6'.3	
11	344° 23'.3	24'.0	149° 49'.7	4'.1	52'.5	6'.3	
12	359° 23'.2	23° 23'.9 N	164° 12'.8	4'.2	17° 46'.2 S	6'.5	61'.2
13	14° 23'.1	23'.8	178° 36'.0	4'.2	39'.7	6'.6	
14	29° 22'.9	23'.8	192° 59'.2	4'.4	33'.1	6'.7	
15	44° 22'.8	23'.7	207° 22'.6	4'.3	26'.4	6'.9	
16	59° 22'.7	23'.7	221° 45'.9	4'.5	19'.5	7'.0	
17	74° 22'.5	23'.6	236° 09'.4	4'.6	12'.5	7'.1	
18	89° 22'.4	23'.6	250° 33'.0	4'.6	05'.4	7'.2	61'.1
19	104° 22'.3	23'.5	264° 56'.6	4'.7	16° 58'.2 S	7'.3	
20	119° 22'.1	23'.4	279° 20'.3	4'.7	50'.9	7'.5	
21	134° 22'.0	23'.4	293° 44'.0	4'.9	43'.4	7'.5	
22	149° 21'.9	23'.3	308° 07'.9	4'.9	35'.9	7'.7	
23	164° 21'.7	23'.2	322° 31'.8	5'.0	28'.2	7'.8	
25 00	179° 21'.6	23° 23'.2 N	336° 55'.8	5'.0	16° 20'.4 S	7'.9	61'.0
01	194° 21'.5	23'.1	351° 19'.8	5'.2	12'.5	8'.0	
02	209° 21'.3	23'.0	5° 44'.0	5'.2	04'.5	8'.1	
03	224° 21'.2	23'.0	20° 08'.2	5'.3	15° 56'.4 S	8'.2	
04	239° 21'.1	22'.9	34° 32'.5	5'.4	48'.2	8'.3	60'.9
05	254° 20'.9	22'.8	48° 56'.9	5'.5	39'.9	8'.5	
06	269° 20'.8	22'.8	63° 21'.4	5'.6	31'.4	8'.5	
07	284° 20'.7	22'.7	77° 46'.0	5'.6	22'.9	8'.6	
08	299° 20'.5	22'.6	92° 10'.6	5'.8	14'.3	8'.7	
09	314° 20'.4	22'.6	106° 35'.4	5'.8	05'.6	8'.9	60'.8
10	329° 20'.3	22'.5	121° 00'.2	5'.9	14° 56'.7 S	8'.9	
11	344° 20'.2	22'.4	135° 25'.1	6'.0	47'.8	9'.0	
12	359° 20'.0	23° 22'.3 N	149° 50'.1	6'.0	14° 38'.8 S	9'.1	60'.8
13	14° 19'.9	22'.3	164° 15'.1	6'.2	29'.7	9'.2	60'.7
14	29° 19'.8	22'.2	178° 40'.3	6'.2	20'.5	9'.2	
15	44° 19'.6	22'.1	193° 05'.5	6'.3	11'.3	9'.4	
16	59° 19'.5	22'.0	207° 30'.8	6'.5	01'.9	9'.4	60'.6
17	74° 19'.4	22'.0	221° 56'.3	6'.5	13° 52'.5 S	9'.6	
18	89° 19'.2	21'.9	236° 21'.8	6'.6	42'.9	9'.6	
19	104° 19'.1	21'.8	250° 47'.4	6'.6	33'.3	9'.7	
20	119° 19'.0	21'.7	265° 13'.0	6'.8	23'.6	9'.7	60'.5
21	134° 18'.8	21'.7	279° 38'.8	6'.8	13'.9	9'.9	
22	149° 18'.7	21'.6	294° 04'.6	7'.0	04'.0	9'.9	
23	164° 18'.6	21'.5	308° 30'.6	7'.0	12° 54'.1 S	10'.0	60'.4
26 00	179° 18'.4	23° 21'.4 N	322° 56'.6	7'.1	12° 44'.1 S	10'.1	60'.4
01	194° 18'.3	21'.3	337° 22'.7	7'.2	34'.0	10'.1	
02	209° 18'.2	21'.2	351° 48'.9	7'.3	23'.9	10'.2	
03	224° 18'.1	21'.2	6° 15'.2	7'.4	13'.7	10'.3	60'.3
04	239° 17'.9	21'.1	20° 41'.6	7'.4	03'.4	10'.3	
05	254° 17'.8	21'.0	35° 08'.0	7'.6	11° 53'.1 S	10'.4	
06	269° 17'.7	20'.9	49° 34'.6	7'.6	42'.7	10'.5	60'.2
07	284° 17'.5	20'.8	64° 01'.2	7'.7	32'.2	10'.5	
08	299° 17'.4	20'.7	78° 27'.9	7'.8	21'.7	10'.6	
09	314° 17'.3	20'.6	92° 54'.7	7'.9	11'.1	10'.6	60'.1
10	329° 17'.1	20'.6	107° 21'.6	8'.0	00'.5	10'.7	
11	344° 17'.0	20'.5	121° 48'.6	8'.0	10° 49'.8 S	10'.8	
12	359° 16'.9	23° 20'.4 N	136° 15'.6	8'.2	10° 39'.0 S	10'.8	60'.0
13	14° 16'.8	20'.3	150° 42'.8	8'.2	28'.2	10'.8	
14	29° 16'.6	20'.2	165° 10'.0	8'.3	17'.4	10'.9	
15	44° 16'.5	20'.1	179° 37'.3	8'.4	06'.5	11'.0	59'.9
16	59° 16'.4	20'.0	194° 04'.7	8'.5	9° 55'.5 S	11'.0	
17	74° 16'.2	19'.9	208° 32'.2	8'.6	44'.5	11'.0	59'.8
18	89° 16'.1	19'.8	222° 59'.8	8'.6	33'.5	11'.1	
19	104° 16'.0	19'.7	237° 27'.4	8'.7	22'.4	11'.1	
20	119° 15'.8	19'.6	251° 55'.1	8'.8	11'.3	11'.2	59'.7
21	134° 15'.7	19'.5	266° 22'.9	8'.9	00'.1	11'.2	
22	149° 15'.6	19'.4	280° 50'.8	9'.0	8° 48'.9 S	11'.3	
23	164° 15'.5	19'.3	295° 18'.8	9'.0	37'.6	11'.2	59'.6
	SD 15'.7	d 0'.1	SD 16'.7		16'.6	16'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 24	Moonrise 25	Moonrise 26
N 72°	-	-	-	23:56	23:28	23:12
N 70°	-	-	-	23:11	23:05	22:59
68°	-	-	-	22:41	22:46	22:49
66°	-	-	-	22:18	22:32	22:40
64°	-	-	01:33	22:00	22:19	22:33
62°	-	-	02:11	21:45	22:09	22:26
60°	-	00:52	02:37	21:33	22:00	22:21
N 58°	-	01:42	02:58	21:22	21:52	22:16
56°	-	02:12	03:15	21:13	21:45	22:11
54°	00:48	02:34	03:29	21:04	21:39	22:07
52°	01:34	02:52	03:41	20:57	21:33	22:04
50°	02:02	03:07	03:52	20:50	21:28	22:00
45°	02:47	03:37	04:14	20:35	21:17	21:53
N 40°	03:18	04:00	04:32	20:23	21:08	21:47
35°	03:41	04:18	04:47	20:13	21:00	21:42
30°	04:00	04:33	05:00	20:04	20:53	21:37
20°	04:29	04:58	05:22	19:48	20:41	21:29
N 10°	04:51	05:18	05:41	19:35	20:31	21:22
0°	05:10	05:36	05:59	19:22	20:21	21:16
S 10°	05:27	05:54	06:16	19:09	20:11	21:09
20°	05:43	06:11	06:35	18:55	20:00	21:02
30°	06:00	06:30	06:56	18:40	19:48	20:54
35°	06:09	06:40	07:08	18:30	19:41	20:49
40°	06:18	06:52	07:23	18:20	19:33	20:44
45°	06:28	07:06	07:39	18:08	19:23	20:38
S 50°	06:40	07:22	08:00	17:53	19:12	20:30
52°	06:45	07:29	08:10	17:46	19:06	20:27
54°	06:51	07:37	08:21	17:38	19:01	20:23
56°	06:57	07:46	08:34	17:29	18:54	20:19
58°	07:04	07:57	08:48	17:19	18:47	20:14
S 60°	07:11	08:08	09:06	17:08	18:38	20:09
S 62°	07:20	08:22	09:27	16:54	18:29	20:03

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 24	Moonset 25	Moonset 26
N 72°	-	-	-	-	03:32	06:00
N 70°	-	-	-	01:57	04:16	06:22
68°	-	-	-	02:50	04:45	06:39
66°	-	-	-	03:22	05:06	06:52
64°	22:31	-	-	03:46	05:23	07:04
62°	21:54	-	-	04:05	05:37	07:13
60°	21:28	23:12	-	04:20	05:49	07:21
N 58°	21:07	22:23	-	04:34	05:59	07:28
56°	20:51	21:53	-	04:45	06:08	07:34
54°	20:36	21:31	23:17	04:55	06:16	07:40
52°	20:24	21:13	22:31	05:03	06:23	07:45
50°	20:13	20:58	22:03	05:11	06:30	07:49
45°	19:51	20:28	21:18	05:28	06:43	07:59
N 40°	19:33	20:06	20:47	05:42	06:54	08:07
35°	19:18	19:48	20:24	05:53	07:04	08:14
30°	19:05	19:32	20:06	06:03	07:12	08:20
20°	18:43	19:07	19:37	06:21	07:26	08:30
N 10°	18:24	18:47	19:14	06:36	07:39	08:39
0°	18:06	18:29	18:55	06:50	07:50	08:47
S 10°	17:49	18:12	18:38	07:04	08:02	08:56
20°	17:30	17:54	18:22	07:18	08:14	09:04
30°	17:09	17:36	18:05	07:35	08:28	09:14
35°	16:57	17:25	17:57	07:45	08:36	09:20
40°	16:43	17:13	17:47	07:56	08:45	09:26
45°	16:26	17:00	17:37	08:09	08:55	09:34
S 50°	16:05	16:44	17:25	08:25	09:08	09:43
52°	15:55	16:36	17:20	08:32	09:14	09:47
54°	15:44	16:28	17:14	08:41	09:20	09:51
56°	15:32	16:19	17:08	08:50	09:27	09:56
58°	15:17	16:09	17:01	09:00	09:35	10:02
S 60°	15:00	15:57	16:54	09:12	09:44	10:08
S 62°	14:38	15:44	16:46	09:26	09:55	10:15

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
24	2 21	2 27	12:02	00:35	13:06	16d 98%
25	2 33	2 40	12:03	01:36	14:06	17d 94%
26	2 46	2 52	12:03	02:34	15:02	18d 87%

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2013 June 27, 28, 29 (Thur, Fri, Sat)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.4	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
27 Thursday 00	275° 16'.2	153° 38'.5	21° 51'.2 N	197° 37'.4	23° 17'.9 N	185° 02'.3	23° 13'.1 N	61° 46'.0	10° 46'.8 S
01	290° 18'.7	168° 37'.8	50'.6	212° 38'.0	18'.1	200° 04'.1	13'.1	76° 48'.5	46'.8
02	305° 21'.1	183° 37'.0	50'.1	227° 38'.6	18'.3	215° 06'.0	13'.1	91° 51'.0	46'.8
03	320° 23'.6	198° 36'.3	49'.5	242° 39'.2	18'.4	230° 07'.8	13'.2	106° 53'.6	46'.8
04	335° 26'.1	213° 35'.5	48'.9	257° 39'.8	18'.6	245° 09'.7	13'.2	121° 56'.1	46'.8
05	350° 28'.5	228° 34'.8	48'.3	272° 40'.4	18'.8	260° 11'.5	13'.2	136° 58'.6	46'.8
06	5° 31'.0	243° 34'.0	47'.6	287° 41'.0	19'.0	275° 13'.3	13'.2	152° 01'.1	46'.7
07	20° 33'.4	258° 33'.3	47'.0	302° 41'.5	19'.1	290° 15'.2	13'.2	167° 03'.6	46'.7
08	35° 35'.9	273° 32'.6	46'.4	317° 42'.1	19'.3	305° 17'.0	13'.2	182° 06'.1	46'.7
09	50° 38'.4	288° 31'.8	45'.8	332° 42'.7	19'.5	320° 18'.9	13'.2	197° 08'.6	46'.7
10	65° 40'.8	303° 31'.1	45'.2	347° 43'.3	19'.6	335° 20'.7	13'.2	212° 11'.1	46'.7
11	80° 43'.3	318° 30'.4	44'.6	2° 43'.9	19'.8	350° 22'.6	13'.2	227° 13'.6	46'.7
12	95° 45'.8	333° 29'.6	21° 44'.0 N	17° 44'.5	23° 20'.0 N	5° 24'.4	23° 13'.2 N	242° 16'.1	10° 46'.7 S
13	110° 48'.2	348° 28'.9	43'.4	32° 45'.1	20'.1	20° 26'.2	13'.2	257° 18'.7	46'.7
14	125° 50'.7	3° 28'.2	42'.8	47° 45'.7	20'.3	35° 28'.1	13'.2	272° 21'.2	46'.7
15	140° 53'.2	18° 27'.4	42'.2	62° 46'.3	20'.5	50° 29'.9	13'.2	287° 23'.7	46'.7
16	155° 55'.6	33° 26'.7	41'.6	77° 46'.9	20'.6	65° 31'.8	13'.2	302° 26'.2	46'.7
17	170° 58'.1	48° 26'.0	41'.0	92° 47'.5	20'.8	80° 33'.6	13'.2	317° 28'.7	46'.7
18	186° 00'.6	63° 25'.2	40'.3	107° 48'.1	21'.0	95° 35'.4	13'.2	332° 31'.2	46'.7
19	201° 03'.0	78° 24'.5	39'.7	122° 48'.7	21'.1	110° 37'.3	13'.2	347° 33'.7	46'.7
20	216° 05'.5	93° 23'.8	39'.1	137° 49'.2	21'.3	125° 39'.1	13'.2	2° 36'.2	46'.7
21	231° 07'.9	108° 23'.0	38'.5	152° 49'.8	21'.5	140° 41'.0	13'.2	17° 38'.7	46'.7
22	246° 10'.4	123° 22'.3	37'.9	167° 50'.4	21'.6	155° 42'.8	13'.2	32° 41'.2	46'.7
23	261° 12'.9	138° 21'.6	37'.3	182° 51'.0	21'.8	170° 44'.7	13'.2	47° 43'.7	46'.7
28 Friday 00	276° 15'.3	153° 20'.8	21° 36'.6 N	197° 51'.6	23° 22'.0 N	185° 46'.5	23° 13'.2 N	62° 46'.2	10° 46'.7 S
01	291° 17'.8	168° 20'.1	36'.0	212° 52'.2	22'.1	200° 48'.3	13'.2	77° 48'.8	46'.7
02	306° 20'.3	183° 19'.4	35'.4	227° 52'.8	22'.3	215° 50'.2	13'.2	92° 51'.3	46'.7
03	321° 22'.7	198° 18'.6	34'.8	242° 53'.4	22'.5	230° 52'.0	13'.2	107° 53'.8	46'.7
04	336° 25'.2	213° 17'.9	34'.1	257° 54'.0	22'.6	245° 53'.9	13'.2	122° 56'.3	46'.7
05	351° 27'.7	228° 17'.2	33'.5	272° 54'.6	22'.8	260° 55'.7	13'.2	137° 58'.8	46'.7
06	6° 30'.1	243° 16'.5	32'.9	287° 55'.2	23'.0	275° 57'.6	13'.2	153° 01'.3	46'.7
07	21° 32'.6	258° 15'.7	32'.3	302° 55'.8	23'.1	290° 59'.4	13'.2	168° 03'.8	46'.6
08	36° 35'.0	273° 15'.0	31'.6	317° 56'.3	23'.3	306° 01'.2	13'.2	183° 06'.3	46'.6
09	51° 37'.5	288° 14'.3	31'.0	332° 56'.9	23'.4	321° 03'.1	13'.2	198° 08'.8	46'.6
10	66° 40'.0	303° 13'.6	30'.4	347° 57'.5	23'.6	336° 04'.9	13'.2	213° 11'.3	46'.6
11	81° 42'.4	318° 12'.8	29'.7	2° 58'.1	23'.8	351° 06'.8	13'.2	228° 13'.8	46'.6
12	96° 44'.9	333° 12'.1	21° 29'.1 N	17° 58'.7	23° 23'.9 N	6° 08'.6	23° 13'.2 N	243° 16'.3	10° 46'.6 S
13	111° 47'.4	348° 11'.4	28'.5	32° 59'.3	24'.1	21° 10'.5	13'.2	258° 18'.8	46'.6
14	126° 49'.8	3° 10'.7	27'.8	47° 59'.9	24'.2	36° 12'.3	13'.2	273° 21'.3	46'.6
15	141° 52'.3	18° 09'.9	27'.2	63° 00'.5	24'.4	51° 14'.1	13'.2	288° 23'.8	46'.6
16	156° 54'.8	33° 09'.2	26'.6	78° 01'.1	24'.5	66° 16'.0	13'.2	303° 26'.4	46'.6
17	171° 57'.2	48° 08'.5	25'.9	93° 01'.7	24'.7	81° 17'.8	13'.2	318° 28'.9	46'.6
18	186° 59'.7	63° 07'.8	25'.3	108° 02'.3	24'.9	96° 19'.7	13'.2	333° 31'.4	46'.6
19	202° 02'.2	78° 07'.1	24'.6	123° 02'.9	25'.0	111° 21'.5	13'.2	348° 33'.9	46'.6
20	217° 04'.6	93° 06'.3	24'.0	138° 03'.5	25'.2	126° 23'.3	13'.2	3° 36'.4	46'.6
21	232° 07'.1	108° 05'.6	23'.4	153° 04'.0	25'.3	141° 25'.2	13'.2	18° 38'.9	46'.6
22	247° 09'.5	123° 04'.9	22'.7	168° 04'.6	25'.5	156° 27'.0	13'.2	33° 41'.4	46'.6
23	262° 12'.0	138° 04'.2	22'.1	183° 05'.2	25'.6	171° 28'.9	13'.2	48° 43'.9	46'.6
29 Saturday 00	277° 14'.5	153° 03'.5	21° 21'.4 N	198° 05'.8	23° 25'.8 N	186° 30'.7	23° 13'.2 N	63° 46'.4	10° 46'.6 S
01	292° 16'.9	168° 02'.7	20'.8	213° 06'.4	26'.0	201° 32'.6	13'.2	78° 48'.9	46'.6
02	307° 19'.4	183° 02'.0	20'.1	228° 07'.0	26'.1	216° 34'.4	13'.2	93° 51'.4	46'.6
03	322° 21'.9	198° 01'.3	19'.5	243° 07'.6	26'.3	231° 36'.2	13'.2	108° 53'.9	46'.6
04	337° 24'.3	213° 00'.6	18'.8	258° 08'.2	26'.4	246° 38'.1	13'.2	123° 56'.4	46'.6
05	352° 26'.8	227° 59'.9	18'.2	273° 08'.8	26'.6	261° 39'.9	13'.2	138° 58'.9	46'.6
06	7° 29'.3	242° 59'.2	17'.5	288° 09'.4	26'.7	276° 41'.8	13'.2	154° 01'.4	46'.6
07	22° 31'.7	257° 58'.4	16'.9	303° 10'.0	26'.9	291° 43'.6	13'.2	169° 03'.9	46'.6
08	37° 34'.2	272° 57'.7	16'.2	318° 10'.6	27'.0	306° 45'.5	13'.2	184° 06'.4	46'.6
09	52° 36'.7	287° 57'.0	15'.6	333° 11'.2	27'.2	321° 47'.3	13'.2	199° 08'.9	46'.6
10	67° 39'.1	302° 56'.3	14'.9	348° 11'.8	27'.3	336° 49'.1	13'.2	214° 11'.4	46'.6
11	82° 41'.6	317° 55'.6	14'.2	3° 12'.3	27'.5	351° 51'.0	13'.2	229° 13'.9	46'.6
12	97° 44'.0	332° 54'.9	21° 13'.6 N	18° 12'.9	23° 27'.6 N	6° 52'.8	23° 13'.2 N	244° 16'.4	10° 46'.6 S
13	112° 46'.5	347° 54'.2	12'.9	33° 13'.5	27'.8	21° 54'.7	13'.2	259° 18'.9	46'.6
14	127° 49'.0	2° 53'.5	12'.3	48° 14'.1	27'.9	36° 56'.5	13'.2	274° 21'.4	46'.6
15	142° 51'.4	17° 52'.8	11'.6	63° 14'.7	28'.1	51° 58'.4	13'.2	289° 23'.9	46'.6
16	157° 53'.9	32° 52'.0	10'.9	78° 15'.3	28'.2	67° 00'.2	13'.2	304° 26'.4	46'.6
17	172° 56'.4	47° 51'.3	10'.3	93° 15'.9	28'.4	82° 02'.1	13'.2	319° 28'.9	46'.6
18	187° 58'.8	62° 50'.6	09'.6	108° 16'.5	28'.5	97° 03'.9	13'.2	334° 31'.4	46'.6
19	203° 01'.3	77° 49'.9	09'.0	123° 17'.1	28'.7	112° 05'.7	13'.2	349° 33'.9	46'.6
20	218° 03'.8	92° 49'.2	08'.3	138° 17'.7	28'.8	127° 07'.6	13'.2	4° 36'.4	46'.6
21	233° 06'.2	107° 48'.5	07'.6	153° 18'.3	29'.0	142° 09'.4	13'.2	19° 38'.9	46'.6
22	248° 08'.7	122° 47'.8	07'.0	168° 18'.9	29'.1	157° 11'.3	13'.2	34° 41'.4	46'.6
23	263° 11'.1	137° 47'.1	06'.3	183° 19'.5	29'.3	172° 13'.1	13'.2	49° 43'.9	46'.6
	M.P. 05:30	v -0'.7	d 0'.6	v 0'.6	d 0'.2	v 1'.8	d 0'.0	v 2'.5	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.6	40° 14'.9 S
Achernar	335° 27'.0	57° 09'.8 S
Acrux	173° 09'.2	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.6 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.6	55° 53'.4 N
Alkaid	152° 58'.7	49° 15'.0 N
Alnair	27° 43'.4	46° 53'.4 S
Alnilam	275° 46'.7	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.4 N
Alpheratz	357° 43'.4	29° 09'.8 N
Altair	62° 07'.9	8° 54'.4 N
Ankaa	353° 15'.7	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.5	19° 06'.9 N
Atria	107° 27'.1	69° 03'.1 S
Avior	234° 18'.5	59° 33'.5 S
Bellatrix	278° 32'.3	6° 21'.6 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.3 S
Capella	280° 34'.8	46° 00'.5 N
Deneb	49° 31'.0	45° 19'.8 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.9	17° 54'.6 S
Dubhe	193° 52'.0	61° 40'.9 N
Elnath	278° 12'.9	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.4 N
Enif	33° 46'.8	9° 56'.3 N
Fomalhaut	15° 23'.8	29° 32'.7 S
Gacrux	172° 00'.8	57° 11'.7 S
Gienah	175° 52'.3	17° 37'.2 S
Hadar	148° 47'.5	60° 26'.5 S
Hamal	328° 00'.8	23° 31'.4 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.4	74° 06'.3 N
Markab	13° 38'.2	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.3	69° 46'.7 S
Mirfak	308° 40'.6	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.7	56° 41'.1 S
Polaris	318° 01'.0	89° 19'.0 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.3	8° 11'.3 S
Rigil Kent	139° 51'.2	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.4	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.5 S
Vega	80° 38'.5	38° 47'.9 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	237° 05'.5	13:47
Mars	281° 36'.3	10:48
Jupiter	269° 31'.2	11:35
Saturn	146° 30'.9	19:46

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
27 00	179° 15'.3	23° 19'.2 N	309° 46'.8	9'.1	8° 26'.4 S	11'.4	59'.6
01	194° 15'.2	19'.1	324° 14'.9	9'.2	15'.0	11'.3	
02	209° 15'.1	19'.0	338° 43'.1	9'.3	03'.7	11'.4	59'.5
03	224° 14'.9	18'.9	353° 11'.4	9'.4	7° 52'.3 S	11'.4	
04	239° 14'.8	18'.8	7° 39'.8	9'.4	40'.9	11'.4	59'.4
05	254° 14'.7	18'.7	22° 08'.2	9'.5	29'.5	11'.5	
06	269° 14'.6	18'.6	36° 36'.7	9'.6	18'.0	11'.5	
07	284° 14'.4	18'.5	51° 05'.3	9'.6	06'.5	11'.5	59'.3
08	299° 14'.3	18'.4	65° 33'.9	9'.8	6° 55'.0 S	11'.6	
09	314° 14'.2	18'.3	80° 02'.7	9'.7	43'.4	11'.6	
10	329° 14'.0	18'.2	94° 31'.4	9'.9	31'.8	11'.5	59'.2
11	344° 13'.9	18'.1	109° 00'.3	10'.0	20'.3	11'.7	
12	359° 13'.8	23° 18'.0 N	123° 29'.3	10'.0	6° 08'.6 S	11'.6	59'.1
13	14° 13'.7	17'.9	137° 58'.3	10'.1	5° 57'.0 S	11'.6	
14	29° 13'.5	17'.8	152° 27'.4	10'.1	45'.4	11'.7	
15	44° 13'.4	17'.7	166° 56'.5	10'.2	33'.7	11'.7	59'.0
16	59° 13'.3	17'.6	181° 25'.7	10'.3	22'.0	11'.7	
17	74° 13'.1	17'.4	195° 55'.0	10'.4	10'.3	11'.7	58'.9
18	89° 13'.0	17'.3	210° 24'.4	10'.4	4° 58'.6 S	11'.7	
19	104° 12'.9	17'.2	224° 53'.8	10'.5	46'.9	11'.7	
20	119° 12'.8	17'.1	239° 23'.3	10'.5	35'.2	11'.7	58'.8
21	134° 12'.6	17'.0	253° 52'.8	10'.6	23'.5	11'.8	
22	149° 12'.5	16'.9	268° 22'.4	10'.7	11'.7	11'.7	58'.7
23	164° 12'.4	16'.8	282° 52'.1	10'.7	4° 00'.0 S	11'.8	
28 00	179° 12'.2	23° 16'.6 N	297° 21'.8	10'.8	3° 48'.2 S	11'.7	58'.7
01	194° 12'.1	16'.5	311° 51'.6	10'.9	36'.5	11'.8	58'.6
02	209° 12'.0	16'.4	326° 21'.5	10'.9	24'.7	11'.7	
03	224° 11'.9	16'.3	340° 51'.4	10'.9	13'.0	11'.8	
04	239° 11'.7	16'.2	355° 21'.3	11'.1	01'.2	11'.8	58'.5
05	254° 11'.6	16'.1	9° 51'.4	11'.1	2° 49'.4 S	11'.7	
06	269° 11'.5	15'.9	24° 21'.5	11'.1	37'.7	11'.8	58'.4
07	284° 11'.4	15'.8	38° 51'.6	11'.2	25'.9	11'.7	
08	299° 11'.2	15'.7	53° 21'.8	11'.2	14'.2	11'.8	
09	314° 11'.1	15'.6	67° 52'.0	11'.3	02'.4	11'.7	58'.3
10	329° 11'.0	15'.4	82° 22'.3	11'.4	1° 50'.7 S	11'.8	
11	344° 10'.8	15'.3	96° 52'.7	11'.4	38'.9	11'.7	58'.2
12	359° 10'.7	23° 15'.2 N	111° 23'.1	11'.5	1° 27'.2 S	11'.7	58'.2
13	14° 10'.6	15'.1	125° 53'.6	11'.5	15'.5	11'.7	
14	29° 10'.5	14'.9	140° 24'.1	11'.5	03'.8	11'.7	58'.1
15	44° 10'.3	14'.8	154° 54'.6	11'.6	0° 52'.1 S	11'.7	
16	59° 10'.2	14'.7	169° 25'.2	11'.7	40'.4	11'.7	58'.0
17	74° 10'.1	14'.6	183° 55'.9	11'.7	28'.7	11'.6	
18	89° 10'.0	14'.4	198° 26'.6	11'.7	17'.1	11'.7	
19	104° 09'.8	14'.3	212° 57'.3	11'.8	05'.4	11'.6	57'.9
20	119° 09'.7	14'.2	227° 28'.1	11'.8	0° 06'.2 N	11'.6	
21	134° 09'.6	14'.0	241° 58'.9	11'.9	17'.8	11'.6	57'.8
22	149° 09'.5	13'.9	256° 29'.8	11'.9	29'.4	11'.6	
23	164° 09'.3	13'.8	271° 00'.7	12'.0	41'.0	11'.5	
29 00	179° 09'.2	23° 13'.6 N	285° 31'.7	12'.0	0° 52'.5 N	11'.5	57'.7
01	194° 09'.1	13'.5	300° 02'.7	12'.0	1° 04'.0 N	11'.5	
02	209° 09'.0	13'.4	314° 33'.7	12'.1	15'.5	11'.5	
03	224° 08'.8	13'.2	329° 04'.8	12'.1	27'.0	11'.5	57'.6
04	239° 08'.7	13'.1	343° 35'.9	12'.1	38'.5	11'.4	
05	254° 08'.6	13'.0	358° 07'.0	12'.2	49'.9	11'.5	57'.5
06	269° 08'.5	12'.8	12° 38'.2	12'.2	2° 01'.4 N	11'.4	
07	284° 08'.3	12'.7	27° 09'.4	12'.3	12'.8	11'.3	
08	299° 08'.2	12'.6	41° 40'.7	12'.2	24'.1	11'.4	57'.4
09	314° 08'.1	12'.4	56° 11'.9	12'.4	35'.5	11'.3	
10	329° 08'.0	12'.3	70° 43'.3	12'.3	46'.8	11'.3	57'.3
11	344° 07'.8	12'.1	85° 14'.6	12'.4	58'.1	11'.2	
12	359° 07'.7	23° 12'.0 N	99° 46'.0	12'.4	3° 09'.3 N	11'.2	57'.3
13	14° 07'.6	11'.9	114° 17'.4	12'.4	20'.5	11'.2	57'.2
14	29° 07'.5	11'.7	128° 48'.8	12'.5	31'.7	11'.2	
15	44° 07'.3	11'.6	143° 20'.3	12'.5	42'.9	11'.1	
16	59° 07'.2	11'.4	157° 51'.8	12'.5	54'.0	11'.1	57'.1
17	74° 07'.1	11'.3	172° 23'.3	12'.6	4° 05'.1 N	11'.1	
18	89° 07'.0	11'.1	186° 54'.9	12'.5	16'.2	11'.0	57'.0
19	104° 06'.8	11'.0	201° 26'.4	12'.6	27'.2	11'.0	
20	119° 06'.7	10'.8	215° 58'.0	12'.7	38'.2	10'.9	
21	134° 06'.6	10'.7	230° 29'.7	12'.6	49'.1	10'.9	56'.9
22	149° 06'.5	10'.5	245° 01'.3	12'.7	5° 00'.0 N	10'.9	
23	164° 06'.3	10'.4	259° 33'.0	12'.7	10'.9	10'.9	
	SD 15'.7	d 0'.1	SD	16'.1	15'.9	15'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29
N 72°	-	-	-	23:00	22:49	22:39
N 70°	-	-	-	22:55	22:50	22:46
68°	-	-	-	22:50	22:51	22:51
66°	-	-	-	22:46	22:51	22:56
64°	-	-	01:37	22:43	22:52	23:00
62°	-	-	02:14	22:40	22:52	23:04
60°	-	00:57	02:39	22:37	22:52	23:07
N 58°	-	01:45	03:00	22:35	22:53	23:09
56°	-	02:14	03:16	22:33	22:53	23:12
54°	00:52	02:36	03:30	22:31	22:53	23:14
52°	01:37	02:54	03:42	22:30	22:53	23:16
50°	02:04	03:09	03:53	22:28	22:53	23:18
45°	02:49	03:38	04:16	22:25	22:54	23:22
N 40°	03:19	04:01	04:34	22:22	22:54	23:26
35°	03:42	04:19	04:48	22:19	22:55	23:28
30°	04:01	04:34	05:01	22:17	22:55	23:31
20°	04:30	04:59	05:23	22:14	22:55	23:36
N 10°	04:52	05:19	05:42	22:10	22:56	23:40
0°	05:11	05:37	06:00	22:07	22:56	23:44
S 10°	05:28	05:54	06:17	22:04	22:57	23:48
20°	05:44	06:11	06:35	22:01	22:57	23:52
30°	06:00	06:30	06:56	21:57	22:58	23:57
35°	06:09	06:41	07:09	21:55	22:58	23:59
40°	06:18	06:52	07:23	21:53	22:59	24:03
45°	06:28	07:06	07:39	21:50	22:59	24:06
S 50°	06:40	07:22	08:00	21:47	23:00	24:11
52°	06:45	07:29	08:10	21:45	23:00	24:13
54°	06:51	07:37	08:21	21:43	23:01	24:15
56°	06:57	07:46	08:33	21:42	23:01	24:17
58°	07:04	07:56	08:48	21:40	23:01	24:20
S 60°	07:11	08:08	09:05	21:37	23:02	24:23
S 62°	07:19	08:21	09:26	21:35	23:02	24:27

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 27	Moonset 28	Moonset 29
N 72°	-	-	-	08:09	10:06	11:58
N 70°	-	-	-	08:19	10:09	11:54
68°	-	-	-	08:28	10:11	11:50
66°	-	-	-	08:35	10:13	11:47
64°	22:29	-	-	08:41	10:15	11:45
62°	21:52	-	-	08:46	10:16	11:43
60°	21:27	23:08	-	08:51	10:18	11:41
N 58°	21:07	22:21	-	08:55	10:19	11:39
56°	20:50	21:52	-	08:58	10:20	11:38
54°	20:36	21:30	23:13	09:01	10:20	11:36
52°	20:24	21:12	22:29	09:04	10:21	11:35
50°	20:13	20:57	22:02	09:07	10:22	11:34
45°	19:51	20:28	21:17	09:12	10:23	11:32
N 40°	19:33	20:06	20:47	09:17	10:25	11:30
35°	19:18	19:48	20:24	09:21	10:26	11:28
30°	19:05	19:32	20:06	09:25	10:27	11:26
20°	18:43	19:08	19:37	09:31	10:28	11:24
N 10°	18:24	18:47	19:14	09:36	10:30	11:21
0°	18:07	18:29	18:56	09:41	10:31	11:19
S 10°	17:50	18:12	18:39	09:45	10:32	11:17
20°	17:31	17:55	18:23	09:51	10:34	11:15
30°	17:10	17:37	18:06	09:56	10:35	11:12
35°	16:58	17:26	17:58	10:00	10:36	11:10
40°	16:44	17:14	17:48	10:03	10:37	11:09
45°	16:27	17:01	17:38	10:07	10:38	11:07
S 50°	16:07	16:45	17:27	10:13	10:39	11:04
52°	15:57	16:38	17:21	10:15	10:40	11:03
54°	15:46	16:30	17:16	10:17	10:40	11:02
56°	15:33	16:21	17:10	10:20	10:41	11:00
58°	15:19	16:10	17:03	10:23	10:42	10:59
S 60°	15:02	15:59	16:56	10:27	10:43	10:57
S 62°	14:40	15:46	16:47	10:31	10:44	10:56

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
27	2 58	3 05	12:03	03:28	15:54	19d 78%
28	3 11	3 17	12:03	04:19	16:44	20d 68%
29	3 23	3 29	12:03	05:08	17:31	21d 58%

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2013 Jun 30, Jul. 1, 2 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
30 Sunday 00	278° 13'.6	152° 46'.4	21° 05'.6 N	198° 20'.1	23° 29'.4 N	187° 15'.0	23° 13'.2 N	64° 46'.4	10° 46'.6 S
01	293° 16'.1	167° 45'.7	04'.9	213° 20'.6	29'.6	202° 16'.8	13'.2	79° 48'.9	46'.6
02	308° 18'.5	182° 45'.0	04'.3	228° 21'.2	29'.7	217° 18'.6	13'.2	94° 51'.4	46'.6
03	323° 21'.0	197° 44'.3	03'.6	243° 21'.8	29'.9	232° 20'.5	13'.2	109° 53'.9	46'.6
04	338° 23'.5	212° 43'.6	02'.9	258° 22'.4	30'.0	247° 22'.3	13'.2	124° 56'.4	46'.6
05	353° 25'.9	227° 42'.9	02'.2	273° 23'.0	30'.1	262° 24'.2	13'.2	139° 58'.9	46'.6
06	8° 28'.4	242° 42'.2	01'.6	288° 23'.6	30'.3	277° 26'.0	13'.2	155° 01'.4	46'.6
07	23° 30'.9	257° 41'.5	00'.9	303° 24'.2	30'.4	292° 27'.9	13'.2	170° 03'.9	46'.6
08	38° 33'.3	272° 40'.8	00'.2	318° 24'.8	30'.6	307° 29'.7	13'.2	185° 06'.4	46'.6
09	53° 35'.8	287° 40'.1	20° 59'.5 N	333° 25'.4	30'.7	322° 31'.5	13'.2	200° 08'.9	46'.6
10	68° 38'.3	302° 39'.4	58'.9	348° 26'.0	30'.9	337° 33'.4	13'.2	215° 11'.4	46'.6
11	83° 40'.7	317° 38'.7	58'.2	3° 26'.6	31'.0	352° 35'.2	13'.2	230° 13'.9	46'.6
12	98° 43'.2	332° 38'.0	20° 57'.5 N	18° 27'.2	23° 31'.1 N	7° 37'.1	23° 13'.2 N	245° 16'.4	10° 46'.6 S
13	113° 45'.6	347° 37'.3	56'.8	33° 27'.8	31'.3	22° 38'.9	13'.2	260° 18'.9	46'.6
14	128° 48'.1	2° 36'.6	56'.1	48° 28'.4	31'.4	37° 40'.8	13'.2	275° 21'.4	46'.6
15	143° 50'.6	17° 35'.9	55'.4	63° 28'.9	31'.6	52° 42'.6	13'.2	290° 23'.9	46'.6
16	158° 53'.0	32° 35'.2	54'.7	78° 29'.5	31'.7	67° 44'.4	13'.2	305° 26'.4	46'.6
17	173° 55'.5	47° 34'.5	54'.1	93° 30'.1	31'.8	82° 46'.3	13'.2	320° 28'.9	46'.6
18	188° 58'.0	62° 33'.8	53'.4	108° 30'.7	32'.0	97° 48'.1	13'.2	335° 31'.4	46'.6
19	204° 00'.4	77° 33'.1	52'.7	123° 31'.3	32'.1	112° 50'.0	13'.2	350° 33'.9	46'.6
20	219° 02'.9	92° 32'.4	52'.0	138° 31'.9	32'.3	127° 51'.8	13'.2	5° 36'.4	46'.6
21	234° 05'.4	107° 31'.7	51'.3	153° 32'.5	32'.4	142° 53'.7	13'.2	20° 38'.9	46'.6
22	249° 07'.8	122° 31'.0	50'.6	168° 33'.1	32'.5	157° 55'.5	13'.2	35° 41'.4	46'.6
23	264° 10'.3	137° 30'.3	49'.9	183° 33'.7	32'.7	172° 57'.4	13'.2	50° 43'.9	46'.6
1 Monday 00	279° 12'.8	152° 29'.6	20° 49'.2 N	198° 34'.3	23° 32'.8 N	187° 59'.2	23° 13'.2 N	65° 46'.4	10° 46'.6 S
01	294° 15'.2	167° 28'.9	48'.5	213° 34'.9	32'.9	203° 01'.0	13'.2	80° 48'.9	46'.6
02	309° 17'.7	182° 28'.2	47'.8	228° 35'.5	33'.1	218° 02'.9	13'.2	95° 51'.4	46'.6
03	324° 20'.1	197° 27'.5	47'.1	243° 36'.1	33'.2	233° 04'.7	13'.2	110° 53'.9	46'.6
04	339° 22'.6	212° 26'.9	46'.4	258° 36'.7	33'.4	248° 06'.6	13'.2	125° 56'.4	46'.6
05	354° 25'.1	227° 26'.2	45'.7	273° 37'.3	33'.5	263° 08'.4	13'.2	140° 58'.9	46'.6
06	9° 27'.5	242° 25'.5	45'.0	288° 37'.9	33'.6	278° 10'.3	13'.2	156° 01'.4	46'.6
07	24° 30'.0	257° 24'.8	44'.3	303° 38'.4	33'.8	293° 12'.1	13'.2	171° 03'.9	46'.6
08	39° 32'.5	272° 24'.1	43'.6	318° 39'.0	33'.9	308° 13'.9	13'.2	186° 06'.4	46'.6
09	54° 34'.9	287° 23'.4	42'.9	333° 39'.6	34'.0	323° 15'.8	13'.2	201° 08'.8	46'.6
10	69° 37'.4	302° 22'.7	42'.2	348° 40'.2	34'.2	338° 17'.6	13'.2	216° 11'.3	46'.6
11	84° 39'.9	317° 22'.0	41'.5	3° 40'.8	34'.3	353° 19'.5	13'.2	231° 13'.8	46'.6
12	99° 42'.3	332° 21'.4	20° 40'.8 N	18° 41'.4	23° 34'.4 N	8° 21'.3	23° 13'.2 N	246° 16'.3	10° 46'.6 S
13	114° 44'.8	347° 20'.7	40'.1	33° 42'.0	34'.6	23° 23'.2	13'.2	261° 18'.8	46'.6
14	129° 47'.2	2° 20'.0	39'.4	48° 42'.6	34'.7	38° 25'.0	13'.2	276° 21'.3	46'.6
15	144° 49'.7	17° 19'.3	38'.7	63° 43'.2	34'.8	53° 26'.9	13'.2	291° 23'.8	46'.6
16	159° 52'.2	32° 18'.6	38'.0	78° 43'.8	35'.0	68° 28'.7	13'.2	306° 26'.3	46'.6
17	174° 54'.6	47° 17'.9	37'.3	93° 44'.4	35'.1	83° 30'.5	13'.2	321° 28'.8	46'.6
18	189° 57'.1	62° 17'.2	36'.5	108° 45'.0	35'.2	98° 32'.4	13'.2	336° 31'.3	46'.6
19	204° 59'.6	77° 16'.6	35'.8	123° 45'.6	35'.3	113° 34'.2	13'.2	351° 33'.8	46'.6
20	220° 02'.0	92° 15'.9	35'.1	138° 46'.2	35'.5	128° 36'.1	13'.2	6° 36'.3	46'.6
21	235° 04'.5	107° 15'.2	34'.4	153° 46'.8	35'.6	143° 37'.9	13'.2	21° 38'.8	46'.6
22	250° 07'.0	122° 14'.5	33'.7	168° 47'.4	35'.7	158° 39'.8	13'.2	36° 41'.3	46'.6
23	265° 09'.4	137° 13'.8	33'.0	183° 48'.0	35'.9	173° 41'.6	13'.2	51° 43'.8	46'.6
2 Tuesday 00	280° 11'.9	152° 13'.2	20° 32'.2 N	198° 48'.5	23° 36'.0 N	188° 43'.5	23° 13'.2 N	66° 46'.3	10° 46'.6 S
01	295° 14'.4	167° 12'.5	31'.5	213° 49'.1	36'.1	203° 45'.3	13'.2	81° 48'.7	46'.6
02	310° 16'.8	182° 11'.8	30'.8	228° 49'.7	36'.3	218° 47'.1	13'.2	96° 51'.2	46'.6
03	325° 19'.3	197° 11'.1	30'.1	243° 50'.3	36'.4	233° 49'.0	13'.2	111° 53'.7	46'.6
04	340° 21'.7	212° 10'.5	29'.4	258° 50'.9	36'.5	248° 50'.8	13'.2	126° 56'.2	46'.6
05	355° 24'.2	227° 09'.8	28'.6	273° 51'.5	36'.6	263° 52'.7	13'.2	141° 58'.7	46'.6
06	10° 26'.7	242° 09'.1	27'.9	288° 52'.1	36'.8	278° 54'.5	13'.2	157° 01'.2	46'.6
07	25° 29'.1	257° 08'.4	27'.2	303° 52'.7	36'.9	293° 56'.4	13'.2	172° 03'.7	46'.6
08	40° 31'.6	272° 07'.7	26'.5	318° 53'.3	37'.0	308° 58'.2	13'.2	187° 06'.2	46'.6
09	55° 34'.1	287° 07'.1	25'.7	333° 53'.9	37'.1	324° 00'.1	13'.2	202° 08'.7	46'.6
10	70° 36'.5	302° 06'.4	25'.0	348° 54'.5	37'.3	339° 01'.9	13'.2	217° 11'.2	46'.6
11	85° 39'.0	317° 05'.7	24'.3	3° 55'.1	37'.4	354° 03'.8	13'.2	232° 13'.7	46'.6
12	100° 41'.5	332° 05'.1	20° 23'.5 N	18° 55'.7	23° 37'.5 N	9° 05'.6	23° 13'.2 N	247° 16'.1	10° 46'.6 S
13	115° 43'.9	347° 04'.4	22'.8	33° 56'.3	37'.6	24° 07'.4	13'.2	262° 18'.6	46'.6
14	130° 46'.4	2° 03'.7	22'.1	48° 56'.9	37'.8	39° 09'.3	13'.2	277° 21'.1	46'.6
15	145° 48'.9	17° 03'.0	21'.4	63° 57'.5	37'.9	54° 11'.1	13'.2	292° 23'.6	46'.6
16	160° 51'.3	32° 02'.4	20'.6	78° 58'.1	38'.0	69° 13'.0	13'.2	307° 26'.1	46'.6
17	175° 53'.8	47° 01'.7	19'.9	93° 58'.7	38'.1	84° 14'.8	13'.2	322° 28'.6	46'.6
18	190° 56'.2	62° 01'.0	19'.1	108° 59'.2	38'.2	99° 16'.7	13'.1	337° 31'.1	46'.6
19	205° 58'.7	77° 00'.4	18'.4	123° 59'.8	38'.4	114° 18'.5	13'.1	352° 33'.6	46'.6
20	221° 01'.2	91° 59'.7	17'.7	139° 00'.4	38'.5	129° 20'.4	13'.1	7° 36'.1	46'.6
21	236° 03'.6	106° 59'.0	16'.9	154° 01'.0	38'.6	144° 22'.2	13'.1	22° 38'.6	46'.6
22	251° 06'.1	121° 58'.4	16'.2	169° 01'.6	38'.7	159° 24'.0	13'.1	37° 41'.0	46'.6
23	266° 08'.6	136° 57'.7	15'.5	184° 02'.2	38'.8	174° 25'.9	13'.1	52° 43'.5	46'.6
	M.P. 05:18	v -0'.7	d 0'.7	v 0'.6	d 0'.1	v 1'.8	d 0'.0	v 2'.5	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.6	40° 14'.9 S
Achernar	335° 27'.0	57° 09'.8 S
Acrux	173° 09'.2	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.6 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.7	55° 53'.4 N
Alkaid	152° 58'.7	49° 15'.0 N
Alnair	27° 43'.4	46° 53'.4 S
Alnilam	275° 46'.6	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.4 N
Alpheratz	357° 43'.4	29° 09'.8 N
Altair	62° 07'.9	8° 54'.4 N
Ankaa	353° 15'.7	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.1	69° 03'.1 S
Avior	234° 18'.5	59° 33'.5 S
Bellatrix	278° 32'.3	6° 21'.6 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.3 S
Capella	280° 34'.8	46° 00'.5 N
Deneb	49° 31'.0	45° 19'.8 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.9	17° 54'.6 S
Dubhe	193° 52'.0	61° 40'.9 N
Elnath	278° 12'.9	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.4 N
Enif	33° 46'.8	9° 56'.4 N
Fomalhaut	15° 23'.8	29° 32'.7 S
Gacrux	172° 00'.8	57° 11'.7 S
Gienah	175° 52'.3	17° 37'.2 S
Hadar	148° 47'.5	60° 26'.5 S
Hamal	328° 00'.8	23° 31'.4 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.5	74° 06'.3 N
Markab	13° 38'.1	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.3	69° 46'.7 S
Mirfak	308° 40'.6	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.7	56° 41'.2 S
Polaris	317° 59'.8	89° 19'.0 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.3	8° 11'.3 S
Rigil Kent	139° 51'.2	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.4	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.2 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.7	43° 29'.5 S
Vega	80° 38'.5	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.9 S
	SHA	Mer.Pass.
Venus	233° 16'.9	13:51
Mars	279° 21'.5	10:45
Jupiter	268° 46'.4	11:27
Saturn	146° 33'.6	19:34

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
179° 06'.2	23° 10'.2 N	274° 04'.7	12'.7	5° 21'.8 N	10'.8	56'.8
194° 06'.1	10'.1	288° 36'.4	12'.7	32'.6	10'.7	
209° 06'.0	09'.9	303° 08'.1	12'.7	43'.3	10'.7	
224° 05'.8	09'.8	317° 39'.8	12'.8	54'.0	10'.7	56'.7
239° 05'.7	09'.6	332° 11'.6	12'.8	6° 04'.7 N	10'.6	
254° 05'.6	09'.5	346° 43'.4	12'.8	15'.3	10'.6	
269° 05'.5	09'.3	1° 15'.2	12'.8	25'.9	10'.6	56'.6
284° 05'.4	09'.2	15° 47'.0	12'.8	36'.5	10'.5	
299° 05'.2	09'.0	30° 18'.8	12'.9	47'.0	10'.5	
314° 05'.1	08'.9	44° 50'.7	12'.8	57'.5	10'.4	56'.5
329° 05'.0	08'.7	59° 22'.5	12'.9	7° 07'.9 N	10'.3	
344° 04'.9	08'.5	73° 54'.4	12'.9	18'.2	10'.4	
359° 04'.7	23° 08'.4 N	88° 26'.3	12'.9	7° 28'.6 N	10'.2	56'.4
14° 04'.6	08'.2	102° 58'.2	12'.9	38'.8	10'.3	
29° 04'.5	08'.1	117° 30'.1	12'.9	49'.1	10'.2	
44° 04'.4	07'.9	132° 02'.0	12'.9	59'.3	10'.1	56'.3
59° 04'.2	07'.7	146° 33'.9	12'.9	8° 09'.4 N	10'.1	
74° 04'.1	07'.6	161° 05'.8	13'.0	19'.5	10'.0	
89° 04'.0	07'.4	175° 37'.8	12'.9	29'.5	10'.0	56'.2
104° 03'.9	07'.3	190° 09'.7	13'.0	39'.5	9'.9	
119° 03'.8	07'.1	204° 41'.7	12'.9	49'.4	9'.9	
134° 03'.6	06'.9	219° 13'.6	13'.0	59'.3	9'.8	56'.1
149° 03'.5	06'.8	233° 45'.6	13'.0	9° 09'.1 N	9'.8	
164° 03'.4	06'.6	248° 17'.6	13'.0	18'.9	9'.7	
179° 03'.3	23° 06'.4 N	262° 49'.6	13'.0	9° 28'.6 N	9'.7	56'.0
194° 03'.2	06'.3	277° 21'.6	12'.9	38'.3	9'.6	
209° 03'.0	06'.1	291° 53'.5	13'.0	47'.9	9'.5	
224° 02'.9	05'.9	306° 25'.5	13'.0	57'.4	9'.5	55'.9
239° 02'.8	05'.8	320° 57'.5	13'.0	10° 06'.9 N	9'.5	
254° 02'.7	05'.6	335° 29'.5	13'.0	16'.4	9'.4	
269° 02'.5	05'.4	350° 01'.5	13'.0	25'.8	9'.3	
284° 02'.4	05'.2	4° 33'.5	13'.0	35'.1	9'.3	55'.8
299° 02'.3	05'.1	19° 05'.5	13'.0	44'.4	9'.2	
314° 02'.2	04'.9	33° 37'.5	13'.0	53'.6	9'.1	
329° 02'.1	04'.7	48° 09'.5	13'.0	11° 02'.7 N	9'.1	55'.7
344° 01'.9	04'.5	62° 41'.5	13'.0	11'.8	9'.0	
359° 01'.8	23° 04'.4 N	77° 13'.5	13'.0	11° 20'.8 N	9'.0	55'.7
14° 01'.7	04'.2	91° 45'.5	12'.9	29'.8	8'.9	
29° 01'.6	04'.0	106° 17'.4	13'.0	38'.7	8'.9	55'.6
44° 01'.5	03'.8	120° 49'.4	13'.0	47'.6	8'.8	
59° 01'.3	03'.7	135° 21'.4	13'.0	56'.4	8'.7	
74° 01'.2	03'.5	149° 53'.4	12'.9	12° 05'.1 N	8'.6	55'.5
89° 01'.1	03'.3	164° 25'.3	13'.0	13'.7	8'.6	
104° 01'.0	03'.1	178° 57'.3	13'.0	22'.3	8'.6	
119° 00'.9	02'.9	193° 29'.3	12'.9	30'.9	8'.4	
134° 00'.8	02'.8	208° 01'.2	13'.0	39'.3	8'.4	55'.4
149° 00'.6	02'.6	222° 33'.2	12'.9	47'.7	8'.4	
164° 00'.5	02'.4	237° 05'.1	12'.9	56'.1	8'.2	
179° 00'.4	23° 02'.2 N	251° 37'.0	12'.9	13° 04'.3 N	8'.2	55'.4
194° 00'.3	02'.0	266° 08'.9	13'.0	12'.5	8'.2	55'.3
209° 00'.2	01'.8	280° 40'.9	12'.9	20'.7	8'.0	
224° 00'.0	01'.7	295° 12'.8	12'.9	28'.7	8'.0	
238° 59'.9	01'.5	309° 44'.7	12'.8	36'.7	8'.0	
253° 59'.8	01'.3	324° 16'.5	12'.9	44'.7	7'.8	55'.2
268° 59'.7	01'.1	338° 48'.4	12'.9	52'.5	7'.8	
283° 59'.6	00'.9	353° 20'.3	12'.8	14° 00'.3 N	7'.7	
298° 59'.5	00'.7	7° 52'.1	12'.9	08'.0	7'.7	
313° 59'.3	00'.5	22° 24'.0	12'.8	15'.7	7'.6	55'.1
328° 59'.2	00'.3	36° 55'.8	12'.8	23'.3	7'.5	
343° 59'.1	00'.1	51° 27'.6	12'.9	30'.8	7'.4	
358° 59'.0	23° 00'.0 N	65° 59'.5	12'.8	14° 38'.2 N	7'.4	55'.1
13° 58'.9	59'.8	80° 31'.3	12'.8	45'.6	7'.3	
28° 58'.7	59'.6	95° 03'.1	12'.7	52'.9	7'.2	55'.0
43° 58'.6	59'.4	109° 34'.8	12'.8	15° 00'.1 N	7'.2	
58° 58'.5	59'.2	124° 06'.6	12'.8	07'.3	7'.0	
73° 58'.4	59'.0	138° 38'.4	12'.7	14'.3	7'.0	
88° 58'.3	58'.8	153° 10'.1	12'.7	21'.3	7'.0	54'.9
103° 58'.2	58'.6	167° 41'.8	12'.7	28'.3	6'.8	
118° 58'.0	58'.4	182° 13'.5	12'.7	35'.1	6'.8	
133° 57'.9	58'.2	196° 45'.2	12'.7	41'.9	6'.7	
148° 57'.8	58'.0	211° 16'.9	12'.7	48'.6	6'.6	
163° 57'.7	57'.8	225° 48'.6	12'.7	55'.2	6'.5	54'.8
SD 15'.7	d 0'.2	SD	15'.4	15'.2	15'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 30	Moonrise 1	Moonrise 2
N 72°	-	-	-	22:28	22:14	21:55
N 70°	-	-	-	22:41	22:37	22:32
68°	-	-	-	22:52	22:54	22:59
66°	-	-	00:21	23:02	23:09	23:19
64°	-	-	01:41	23:09	23:21	23:35
62°	-	-	02:17	23:16	23:31	23:49
60°	-	01:04	02:42	23:22	23:39	24:00
N 58°	-	01:49	03:02	23:27	23:47	24:10
56°	-	02:17	03:18	23:32	23:54	24:19
54°	00:58	02:39	03:32	23:36	24:00	24:27
52°	01:40	02:56	03:44	23:40	-	00:05
50°	02:07	03:11	03:55	23:43	-	00:10
45°	02:51	03:40	04:17	23:51	-	00:21
N 40°	03:21	04:02	04:35	23:57	-	00:30
35°	03:44	04:20	04:50	-	00:02	00:38
30°	04:02	04:35	05:02	-	00:07	00:44
20°	04:31	05:00	05:24	-	00:16	00:56
N 10°	04:53	05:20	05:43	-	00:23	01:07
0°	05:12	05:38	06:00	-	00:30	01:16
S 10°	05:28	05:55	06:17	-	00:37	01:26
20°	05:44	06:12	06:36	-	00:45	01:37
30°	06:00	06:30	06:57	-	00:53	01:49
35°	06:09	06:41	07:09	-	00:58	01:56
40°	06:18	06:52	07:23	00:03	01:04	02:04
45°	06:28	07:05	07:39	00:06	01:11	02:13
S 50°	06:40	07:21	07:59	00:11	01:19	02:25
52°	06:45	07:28	08:09	00:13	01:23	02:30
54°	06:50	07:36	08:20	00:15	01:27	02:36
56°	06:57	07:45	08:32	00:17	01:31	02:42
58°	07:03	07:55	08:47	00:20	01:36	02:50
S 60°	07:10	08:07	09:04	00:23	01:42	02:58
S 62°	07:19	08:20	09:24	00:27	01:49	03:08

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 30	Moonset 1	Moonset 2
N 72°	-	-	-	13:47	15:37	17:34
N 70°	-	-	-	13:36	15:16	16:57
68°	-	-	-	13:26	15:00	16:32
66°	23:39	-	-	13:18	14:47	16:12
64°	22:25	-	-	13:12	14:36	15:57
62°	21:50	-	-	13:06	14:26	15:44
60°	21:25	23:02	-	13:01	14:18	15:33
N 58°	21:05	22:18	-	12:57	14:12	15:23
56°	20:49	21:50	-	12:53	14:05	15:15
54°	20:35	21:29	23:07	12:49	14:00	15:08
52°	20:23	21:11	22:27	12:46	13:55	15:01
50°	20:12	20:56	22:01	12:43	13:51	14:55
45°	19:50	20:27	21:17	12:37	13:41	14:43
N 40°	19:33	20:05	20:47	12:32	13:33	14:32
35°	19:18	19:47	20:24	12:28	13:26	14:23
30°	19:05	19:32	20:06	12:24	13:20	14:15
20°	18:43	19:08	19:37	12:17	13:10	14:02
N 10°	18:25	18:48	19:15	12:11	13:01	13:50
0°	18:08	18:30	18:56	12:06	12:52	13:39
S 10°	17:50	18:13	18:39	12:00	12:44	13:28
20°	17:32	17:56	18:24	11:55	12:35	13:16
30°	17:11	17:38	18:07	11:48	12:25	13:02
35°	16:59	17:27	17:59	11:44	12:19	12:55
40°	16:45	17:16	17:50	11:40	12:12	12:46
45°	16:29	17:02	17:40	11:35	12:04	12:36
S 50°	16:08	16:47	17:28	11:29	11:55	12:23
52°	15:59	16:39	17:23	11:26	11:51	12:18
54°	15:48	16:31	17:17	11:23	11:46	12:11
56°	15:36	16:23	17:11	11:20	11:41	12:04
58°	15:21	16:13	17:05	11:16	11:35	11:56
S 60°	15:04	16:01	16:58	11:12	11:28	11:47
S 62°	14:43	15:48	16:49	11:08	11:21	11:37

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
30	3 35	3 41	12:04	05:55	18:18	22d 47%
1	3 47	3 52	12:04	06:41	19:04	23d 37%
2	3 58	4 04	12:04	07:28	19:51	24d 28%

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2013 July 3, 4, 5 (Wed, Thur, Fri)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
3 Wednesday 00	281° 11'.0	151° 57'.0	20° 14'.7 N	199° 02'.8	23° 39'.0 N	189° 27'.7	23° 13'.1 N	67° 46'.0	10° 46'.6 S
01	296° 13'.5	166° 56'.4	14'.0	214° 03'.4	39'.1	204° 29'.6	13'.1	82° 48'.5	46'.6
02	311° 16'.0	181° 55'.7	13'.2	229° 04'.0	39'.2	219° 31'.4	13'.1	97° 51'.0	46'.7
03	326° 18'.4	196° 55'.0	12'.5	244° 04'.6	39'.3	234° 33'.3	13'.1	112° 53'.5	46'.7
04	341° 20'.9	211° 54'.4	11'.7	259° 05'.2	39'.4	249° 35'.1	13'.1	127° 56'.0	46'.7
05	356° 23'.3	226° 53'.7	11'.0	274° 05'.8	39'.6	264° 37'.0	13'.1	142° 58'.5	46'.7
06	11° 25'.8	241° 53'.0	10'.2	289° 06'.4	39'.7	279° 38'.8	13'.1	158° 00'.9	46'.7
07	26° 28'.3	256° 52'.4	09'.5	304° 07'.0	39'.8	294° 40'.7	13'.1	173° 03'.4	46'.7
08	41° 30'.7	271° 51'.7	08'.7	319° 07'.6	39'.9	309° 42'.5	13'.1	188° 05'.9	46'.7
09	56° 33'.2	286° 51'.0	08'.0	334° 08'.2	40'.0	324° 44'.3	13'.1	203° 08'.4	46'.7
10	71° 35'.7	301° 50'.4	07'.2	349° 08'.8	40'.1	339° 46'.2	13'.1	218° 10'.9	46'.7
11	86° 38'.1	316° 49'.7	06'.5	4° 09'.4	40'.2	354° 48'.0	13'.1	233° 13'.4	46'.7
12	101° 40'.6	331° 49'.1	20° 05'.7 N	19° 10'.0	23° 40'.4 N	9° 49'.9	23° 13'.1 N	248° 15'.9	10° 46'.7 S
13	116° 43'.1	346° 48'.4	05'.0	34° 10'.6	40'.5	24° 51'.7	13'.1	263° 18'.4	46'.7
14	131° 45'.5	1° 47'.8	04'.2	49° 11'.2	40'.6	39° 53'.6	13'.1	278° 20'.8	46'.7
15	146° 48'.0	16° 47'.1	03'.5	64° 11'.8	40'.7	54° 55'.4	13'.1	293° 23'.3	46'.7
16	161° 50'.5	31° 46'.4	02'.7	79° 12'.3	40'.8	69° 57'.3	13'.1	308° 25'.8	46'.7
17	176° 52'.9	46° 45'.8	02'.0	94° 12'.9	40'.9	84° 59'.1	13'.1	323° 28'.3	46'.7
18	191° 55'.4	61° 45'.1	01'.2	109° 13'.5	41'.0	100° 01'.0	13'.1	338° 30'.8	46'.7
19	206° 57'.8	76° 44'.5	00'.4	124° 14'.1	41'.2	115° 02'.8	13'.1	353° 33'.3	46'.7
20	222° 00'.3	91° 43'.8	19° 59'.7 N	139° 14'.7	41'.3	130° 04'.6	13'.1	8° 35'.8	46'.7
21	237° 02'.8	106° 43'.2	58'.9	154° 15'.3	41'.4	145° 06'.5	13'.1	23° 38'.2	46'.7
22	252° 05'.2	121° 42'.5	58'.1	169° 15'.9	41'.5	160° 08'.3	13'.1	38° 40'.7	46'.7
23	267° 07'.7	136° 41'.8	57'.4	184° 16'.5	41'.6	175° 10'.2	13'.1	53° 43'.2	46'.7
4 Thursday 00	282° 10'.2	151° 41'.2	19° 56'.6 N	199° 17'.1	23° 41'.7 N	190° 12'.0	23° 13'.0 N	68° 45'.7	10° 46'.7 S
01	297° 12'.6	166° 40'.5	55'.9	214° 17'.7	41'.8	205° 13'.9	13'.0	83° 48'.2	46'.7
02	312° 15'.1	181° 39'.9	55'.1	229° 18'.3	41'.9	220° 15'.7	13'.0	98° 50'.7	46'.8
03	327° 17'.6	196° 39'.2	54'.3	244° 18'.9	42'.0	235° 17'.6	13'.0	113° 53'.1	46'.8
04	342° 20'.0	211° 38'.6	53'.6	259° 19'.5	42'.1	250° 19'.4	13'.0	128° 55'.6	46'.8
05	357° 22'.5	226° 37'.9	52'.8	274° 20'.1	42'.3	265° 21'.3	13'.0	143° 58'.1	46'.8
06	12° 25'.0	241° 37'.3	52'.0	289° 20'.7	42'.4	280° 23'.1	13'.0	159° 00'.6	46'.8
07	27° 27'.4	256° 36'.6	51'.2	304° 21'.3	42'.5	295° 25'.0	13'.0	174° 03'.1	46'.8
08	42° 29'.9	271° 36'.0	50'.5	319° 21'.9	42'.6	310° 26'.8	13'.0	189° 05'.6	46'.8
09	57° 32'.3	286° 35'.3	49'.7	334° 22'.5	42'.7	325° 28'.6	13'.0	204° 08'.0	46'.8
10	72° 34'.8	301° 34'.7	48'.9	349° 23'.1	42'.8	340° 30'.5	13'.0	219° 10'.5	46'.8
11	87° 37'.3	316° 34'.0	48'.1	4° 23'.7	42'.9	355° 32'.3	13'.0	234° 13'.0	46'.8
12	102° 39'.7	331° 33'.4	19° 47'.4 N	19° 24'.3	23° 43'.0 N	10° 34'.2	23° 13'.0 N	249° 15'.5	10° 46'.8 S
13	117° 42'.2	346° 32'.8	46'.6	34° 24'.9	43'.1	25° 36'.0	13'.0	264° 18'.0	46'.8
14	132° 44'.7	1° 32'.1	45'.8	49° 25'.5	43'.2	40° 37'.9	13'.0	279° 20'.5	46'.8
15	147° 47'.1	16° 31'.5	45'.0	64° 26'.1	43'.3	55° 39'.7	13'.0	294° 22'.9	46'.8
16	162° 49'.6	31° 30'.8	44'.3	79° 26'.7	43'.4	70° 41'.6	13'.0	309° 25'.4	46'.8
17	177° 52'.1	46° 30'.2	43'.5	94° 27'.3	43'.5	85° 43'.4	13'.0	324° 27'.9	46'.8
18	192° 54'.5	61° 29'.5	42'.7	109° 27'.9	43'.6	100° 45'.3	13'.0	339° 30'.4	46'.8
19	207° 57'.0	76° 28'.9	41'.9	124° 28'.4	43'.7	115° 47'.1	13'.0	354° 32'.9	46'.8
20	222° 59'.5	91° 28'.3	41'.1	139° 29'.0	43'.8	130° 49'.0	13'.0	9° 35'.4	46'.8
21	238° 01'.9	106° 27'.6	40'.3	154° 29'.6	43'.9	145° 50'.8	13'.0	24° 37'.8	46'.9
22	253° 04'.4	121° 27'.0	39'.6	169° 30'.2	44'.0	160° 52'.7	12'.9	39° 40'.3	46'.9
23	268° 06'.8	136° 26'.3	38'.8	184° 30'.8	44'.1	175° 54'.5	12'.9	54° 42'.8	46'.9
5 Friday 00	283° 09'.3	151° 25'.7	19° 38'.0 N	199° 31'.4	23° 44'.2 N	190° 56'.3	23° 12'.9 N	69° 45'.3	10° 46'.9 S
01	298° 11'.8	166° 25'.1	37'.2	214° 32'.0	44'.3	205° 58'.2	12'.9	84° 47'.8	46'.9
02	313° 14'.2	181° 24'.4	36'.4	229° 32'.6	44'.4	221° 00'.0	12'.9	99° 50'.2	46'.9
03	328° 16'.7	196° 23'.8	35'.6	244° 33'.2	44'.5	236° 01'.9	12'.9	114° 52'.7	46'.9
04	343° 19'.2	211° 23'.1	34'.8	259° 33'.8	44'.6	251° 03'.7	12'.9	129° 55'.2	46'.9
05	358° 21'.6	226° 22'.5	34'.0	274° 34'.4	44'.7	266° 05'.6	12'.9	144° 57'.7	46'.9
06	13° 24'.1	241° 21'.9	33'.2	289° 35'.0	44'.8	281° 07'.4	12'.9	160° 00'.2	46'.9
07	28° 26'.6	256° 21'.2	32'.5	304° 35'.6	44'.9	296° 09'.3	12'.9	175° 02'.6	46'.9
08	43° 29'.0	271° 20'.6	31'.7	319° 36'.2	45'.0	311° 11'.1	12'.9	190° 05'.1	46'.9
09	58° 31'.5	286° 20'.0	30'.9	334° 36'.8	45'.1	326° 13'.0	12'.9	205° 07'.6	46'.9
10	73° 33'.9	301° 19'.3	30'.1	349° 37'.4	45'.2	341° 14'.8	12'.9	220° 10'.1	46'.9
11	88° 36'.4	316° 18'.7	29'.3	4° 38'.0	45'.3	356° 16'.7	12'.9	235° 12'.6	46'.9
12	103° 38'.9	331° 18'.1	19° 28'.5 N	19° 38'.6	23° 45'.4 N	11° 18'.5	23° 12'.9 N	250° 15'.0	10° 46'.9 S
13	118° 41'.3	346° 17'.4	27'.7	34° 39'.2	45'.5	26° 20'.4	12'.9	265° 17'.5	47'.0
14	133° 43'.8	1° 16'.8	26'.9	49° 39'.8	45'.6	41° 22'.2	12'.9	280° 20'.0	47'.0
15	148° 46'.3	16° 16'.2	26'.1	64° 40'.4	45'.7	56° 24'.1	12'.9	295° 22'.5	47'.0
16	163° 48'.7	31° 15'.5	25'.3	79° 41'.0	45'.8	71° 25'.9	12'.9	310° 24'.9	47'.0
17	178° 51'.2	46° 14'.9	24'.5	94° 41'.6	45'.9	86° 27'.7	12'.8	325° 27'.4	47'.0
18	193° 53'.7	61° 14'.3	23'.7	109° 42'.2	46'.0	101° 29'.6	12'.8	340° 29'.9	47'.0
19	208° 56'.1	76° 13'.6	22'.9	124° 42'.8	46'.1	116° 31'.4	12'.8	355° 32'.4	47'.0
20	223° 58'.6	91° 13'.0	22'.1	139° 43'.4	46'.2	131° 33'.3	12'.8	10° 34'.9	47'.0
21	239° 01'.1	106° 12'.4	21'.2	154° 44'.0	46'.3	146° 35'.1	12'.8	25° 37'.3	47'.0
22	254° 03'.5	121° 11'.8	20'.4	169° 44'.6	46'.4	161° 37'.0	12'.8	40° 39'.8	47'.0
23	269° 06'.0	136° 11'.1	19'.6	184° 45'.2	46'.5	176° 38'.8	12'.8	55° 42'.3	47'.0
	M.P. 05:07	v -0'.6	d 0'.8	v 0'.6	d 0'.1	v 1'.8	d 0'.0	v 2'.5	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.6	40° 14'.9 S
Achernar	335° 26'.9	57° 09'.8 S
Acrux	173° 09'.2	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.6 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.7	55° 53'.4 N
Alkaid	152° 58'.8	49° 15'.0 N
Alnair	27° 43'.4	46° 53'.4 S
Alnilam	275° 46'.6	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.4 N
Alpheratz	357° 43'.3	29° 09'.8 N
Altair	62° 07'.9	8° 54'.4 N
Ankaa	353° 15'.7	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.1	69° 03'.1 S
Avior	234° 18'.6	59° 33'.4 S
Bellatrix	278° 32'.3	6° 21'.6 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.3 S
Capella	280° 34'.8	46° 00'.4 N
Deneb	49° 31'.0	45° 19'.8 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.8	17° 54'.6 S
Dubhe	193° 52'.0	61° 40'.8 N
Elnath	278° 12'.9	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.5 N
Enif	33° 46'.8	9° 56'.4 N
Fomalhaut	15° 23'.8	29° 32'.7 S
Gacrux	172° 00'.8	57° 11'.7 S
Gienah	175° 52'.3	17° 37'.2 S
Hadar	148° 47'.5	60° 26'.5 S
Hamal	328° 00'.8	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.5	74° 06'.3 N
Markab	13° 38'.1	15° 16'.7 N
Menkar	314° 15'.2	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.3	69° 46'.7 S
Mirfak	308° 40'.6	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.2 S
Polaris	317° 58'.3	89° 19'.0 N
Pollux	243° 28'.1	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.3	8° 11'.3 S
Rigil Kent	139° 51'.2	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.4	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.2 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.8	43° 29'.5 S
Vega	80° 38'.5	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	229° 31'.0	13:54
Mars	277° 06'.9	10:42
Jupiter	268° 01'.9	11:18
Saturn	146° 35'.5	19:22

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
3 Wednesday 00	178° 57'.6	22° 57'.6 N	240° 20'.3	12'.6	16° 01'.7 N	6'.5	54'.8
01	193° 57'.5	57'.4	254° 51'.9	12'.6	08'.2	6'.4	
02	208° 57'.3	57'.2	269° 23'.5	12'.7	14'.6	6'.3	
03	223° 57'.2	57'.0	283° 55'.2	12'.6	20'.9	6'.2	
04	238° 57'.1	56'.8	298° 26'.8	12'.6	27'.1	6'.2	
05	253° 57'.0	56'.6	312° 58'.4	12'.5	33'.3	6'.1	54'.7
06	268° 56'.9	56'.4	327° 29'.9	12'.6	39'.4	6'.0	
07	283° 56'.8	56'.2	342° 01'.5	12'.5	45'.4	5'.9	
08	298° 56'.7	56'.0	356° 33'.0	12'.6	51'.3	5'.8	
09	313° 56'.5	55'.8	11° 04'.6	12'.5	57'.1	5'.8	
10	328° 56'.4	55'.5	25° 36'.1	12'.5	17° 02'.9 N	5'.6	54'.6
11	343° 56'.3	55'.3	40° 07'.6	12'.5	08'.5	5'.6	
12	358° 56'.2	22° 55'.1 N	54° 39'.1	12'.5	17° 14'.1 N	5'.5	54'.6
13	13° 56'.1	54'.9	69° 10'.6	12'.4	19'.6	5'.5	
14	28° 56'.0	54'.7	83° 42'.0	12'.5	25'.1	5'.3	
15	43° 55'.9	54'.5	98° 13'.5	12'.4	30'.4	5'.3	
16	58° 55'.7	54'.3	112° 44'.9	12'.4	35'.7	5'.1	54'.5
17	73° 55'.6	54'.1	127° 16'.3	12'.4	40'.8	5'.1	
18	88° 55'.5	53'.9	141° 47'.7	12'.4	45'.9	5'.1	
19	103° 55'.4	53'.6	156° 19'.1	12'.4	51'.0	4'.9	
20	118° 55'.3	53'.4	170° 50'.5	12'.4	55'.9	4'.8	
21	133° 55'.2	53'.2	185° 21'.9	12'.3	18° 00'.7 N	4'.8	
22	148° 55'.1	53'.0	199° 53'.2	12'.3	05'.5	4'.7	
23	163° 55'.0	52'.8	214° 24'.5	12'.4	10'.2	4'.6	54'.4
4 Thursday 00	178° 54'.8	22° 52'.6 N	228° 55'.9	12'.3	18° 14'.8 N	4'.5	54'.4
01	193° 54'.7	52'.4	243° 27'.2	12'.3	19'.3	4'.4	
02	208° 54'.6	52'.1	257° 58'.5	12'.2	23'.7	4'.3	
03	223° 54'.5	51'.9	272° 29'.7	12'.3	28'.0	4'.2	
04	238° 54'.4	51'.7	287° 01'.0	12'.2	32'.2	4'.2	
05	253° 54'.3	51'.5	301° 32'.2	12'.3	36'.4	4'.1	
06	268° 54'.2	51'.3	316° 03'.5	12'.2	40'.5	4'.0	54'.3
07	283° 54'.1	51'.0	330° 34'.7	12'.2	44'.5	3'.9	
08	298° 53'.9	50'.8	345° 05'.9	12'.2	48'.4	3'.8	
09	313° 53'.8	50'.6	359° 37'.1	12'.2	52'.2	3'.7	
10	328° 53'.7	50'.4	14° 08'.3	12'.2	55'.9	3'.6	
11	343° 53'.6	50'.1	28° 39'.5	12'.2	59'.5	3'.6	
12	358° 53'.5	22° 49'.9 N	43° 10'.7	12'.1	19° 03'.1 N	3'.4	54'.3
13	13° 53'.4	49'.7	57° 41'.8	12'.2	06'.5	3'.4	
14	28° 53'.3	49'.5	72° 13'.0	12'.1	09'.9	3'.2	
15	43° 53'.2	49'.2	86° 44'.1	12'.1	13'.1	3'.2	54'.2
16	58° 53'.1	49'.0	101° 15'.2	12'.1	16'.3	3'.1	
17	73° 52'.9	48'.8	115° 46'.3	12'.1	19'.4	3'.0	
18	88° 52'.8	48'.5	130° 17'.4	12'.1	22'.4	3'.0	
19	103° 52'.7	48'.3	144° 48'.5	12'.1	25'.4	2'.8	
20	118° 52'.6	48'.1	159° 19'.6	12'.1	28'.2	2'.7	
21	133° 52'.5	47'.9	173° 50'.7	12'.0	30'.9	2'.7	
22	148° 52'.4	47'.6	188° 21'.7	12'.1	33'.6	2'.5	
23	163° 52'.3	47'.4	202° 52'.8	12'.0	36'.1	2'.5	
5 Friday 00	178° 52'.2	22° 47'.2 N	217° 23'.8	12'.1	19° 38'.6 N	2'.3	54'.2
01	193° 52'.1	46'.9	231° 54'.9	12'.0	40'.9	2'.3	54'.1
02	208° 52'.0	46'.7	246° 25'.9	12'.0	43'.2	2'.2	
03	223° 51'.8	46'.4	260° 56'.9	12'.0	45'.4	2'.1	
04	238° 51'.7	46'.2	275° 27'.9	12'.1	47'.5	2'.0	
05	253° 51'.6	46'.0	289° 59'.0	12'.0	49'.5	1'.9	
06	268° 51'.5	45'.7	304° 30'.0	12'.0	51'.4	1'.8	
07	283° 51'.4	45'.5	319° 01'.0	11'.9	53'.2	1'.8	
08	298° 51'.3	45'.3	333° 31'.9	12'.0	55'.0	1'.6	
09	313° 51'.2	45'.0	348° 02'.9	12'.0	56'.6	1'.6	
10	328° 51'.1	44'.8	2° 33'.9	12'.0	58'.2	1'.4	
11	343° 51'.0	44'.5	17° 04'.9	12'.0	59'.6	1'.4	
12	358° 50'.9	22° 44'.3 N	31° 35'.9	11'.9	20° 01'.0 N	1'.2	54'.1
13	13° 50'.8	44'.0	46° 06'.8	12'.0	02'.2	1'.2	
14	28° 50'.7	43'.8	60° 37'.8	12'.0	03'.4	1'.1	54'.0
15	43° 50'.5	43'.6	75° 08'.8	11'.9	04'.5	1'.0	
16	58° 50'.4	43'.3	89° 39'.7	12'.0	05'.5	0'.9	
17	73° 50'.3	43'.1	104° 10'.7	12'.0	06'.4	0'.8	
18	88° 50'.2	42'.8	118° 41'.7	11'.9	07'.2	0'.7	
19	103° 50'.1	42'.6	133° 12'.6	12'.0	07'.9	0'.6	
20	118° 50'.0	42'.3	147° 43'.6	11'.9	08'.5	0'.5	
21	133° 49'.9	42'.1	162° 14'.5	12'.0	09'.0	0'.4	
22	148° 49'.8	41'.8	176° 45'.5	12'.0	09'.4	0'.4	
23	163° 49'.7	41'.6	191° 16'.5	11'.9	09'.8	0'.2	
	SD 15'.7	d 0'.2	SD 14'.9		14'.8		14'.7

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5
N 72°	-	-	-	21:01	-	-
N 70°	-	-	-	22:28	22:22	-
68°	-	-	-	23:07	23:24	23:58
66°	-	-	00:42	23:34	23:59	24:37
64°	-	-	01:47	23:55	-	00:24
62°	-	-	02:21	-	00:12	00:44
60°	-	01:11	02:46	00:00	00:26	01:00
N 58°	-	01:53	03:05	00:10	00:39	01:14
56°	-	02:21	03:21	00:19	00:49	01:26
54°	01:06	02:42	03:35	00:27	00:58	01:36
52°	01:44	02:59	03:47	00:34	01:07	01:45
50°	02:10	03:13	03:57	00:40	01:14	01:54
45°	02:53	03:42	04:19	00:54	01:30	02:11
N 40°	03:23	04:04	04:36	01:05	01:43	02:26
35°	03:45	04:22	04:51	01:15	01:55	02:38
30°	04:03	04:36	05:04	01:23	02:04	02:48
20°	04:32	05:01	05:25	01:38	02:21	03:07
N 10°	04:54	05:21	05:44	01:51	02:36	03:23
0°	05:12	05:38	06:01	02:03	02:50	03:38
S 10°	05:29	05:55	06:18	02:15	03:04	03:53
20°	05:44	06:12	06:36	02:28	03:19	04:09
30°	06:00	06:30	06:56	02:43	03:36	04:27
35°	06:09	06:40	07:08	02:52	03:46	04:38
40°	06:18	06:52	07:22	03:02	03:58	04:51
45°	06:28	07:05	07:38	03:14	04:11	05:05
S 50°	06:39	07:20	07:59	03:28	04:28	05:23
52°	06:44	07:28	08:08	03:35	04:36	05:32
54°	06:50	07:35	08:19	03:42	04:44	05:41
56°	06:56	07:44	08:31	03:50	04:54	05:52
58°	07:02	07:54	08:45	04:00	05:05	06:04
S 60°	07:09	08:05	09:01	04:11	05:18	06:19
S 62°	07:17	08:18	09:22	04:23	05:34	06:36

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 3	Moonset 4	Moonset 5
N 72°	-	-	-	20:06	-	-
N 70°	-	-	-	18:40	20:25	-
68°	-	-	-	18:01	19:23	20:29
66°	23:21	-	-	17:34	18:48	19:49
64°	22:20	-	-	17:14	18:23	19:22
62°	21:46	-	-	16:57	18:04	19:00
60°	21:22	22:55	-	16:43	17:47	18:43
N 58°	21:03	22:14	-	16:31	17:34	18:29
56°	20:47	21:47	-	16:21	17:22	18:17
54°	20:34	21:26	23:01	16:12	17:12	18:06
52°	20:22	21:09	22:23	16:04	17:03	17:56
50°	20:11	20:55	21:58	15:57	16:55	17:48
45°	19:50	20:26	21:15	15:42	16:38	17:30
N 40°	19:32	20:05	20:46	15:29	16:24	17:15
35°	19:18	19:47	20:23	15:18	16:12	17:02
30°	19:05	19:32	20:05	15:09	16:01	16:51
20°	18:44	19:08	19:37	14:53	15:43	16:33
N 10°	18:25	18:48	19:15	14:39	15:28	16:16
0°	18:08	18:31	18:57	14:26	15:13	16:01
S 10°	17:51	18:14	18:40	14:12	14:59	15:46
20°	17:33	17:57	18:24	13:59	14:43	15:29
30°	17:13	17:39	18:09	13:43	14:25	15:11
35°	17:01	17:29	18:00	13:33	14:15	15:00
40°	16:47	17:17	17:51	13:23	14:03	14:47
45°	16:31	17:04	17:41	13:10	13:49	14:32
S 50°	16:11	16:49	17:30	12:55	13:32	14:14
52°	16:01	16:41	17:25	12:48	13:24	14:06
54°	15:50	16:34	17:19	12:40	13:15	13:56
56°	15:38	16:25	17:14	12:32	13:05	13:45
58°	15:24	16:15	17:07	12:22	12:53	13:33
S 60°	15:08	16:04	17:00	12:11	12:40	13:18
S 62°	14:47	15:51	16:52	11:58	12:25	13:01

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
3	4 09	4 15	12:04	08:14	20:38	25d 20%
4	4 20	4 26	12:04	09:02	21:25	26d 13%
5	4 31	4 36	12:05	09:49	22:13	27d 7%

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2013 July 6, 7, 8 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.5		JUPITER -1.9		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
6 Saturday 00	284° 08'.4	151° 10'.5	19° 18'.8 N	199° 45'.8	23° 46'.6 N	191° 40'.7	23° 12'.8 N	70° 44'.8	10° 47'.0 S
01	299° 10'.9	166° 09'.9	18'.0	214° 46'.4	46'.7	206° 42'.5	12'.8	85° 47'.2	47'.0
02	314° 13'.4	181° 09'.3	17'.2	229° 47'.0	46'.8	221° 44'.4	12'.8	100° 49'.7	47'.0
03	329° 15'.8	196° 08'.6	16'.4	244° 47'.6	46'.8	236° 46'.2	12'.8	115° 52'.2	47'.1
04	344° 18'.3	211° 08'.0	15'.6	259° 48'.2	46'.9	251° 48'.1	12'.8	130° 54'.7	47'.1
05	359° 20'.8	226° 07'.4	14'.8	274° 48'.8	47'.0	266° 49'.9	12'.8	145° 57'.1	47'.1
06	14° 23'.2	241° 06'.8	13'.9	289° 49'.4	47'.1	281° 51'.8	12'.8	160° 59'.6	47'.1
07	29° 25'.7	256° 06'.1	13'.1	304° 50'.0	47'.2	296° 53'.6	12'.8	176° 02'.1	47'.1
08	44° 28'.2	271° 05'.5	12'.3	319° 50'.6	47'.3	311° 55'.5	12'.8	191° 04'.6	47'.1
09	59° 30'.6	286° 04'.9	11'.5	334° 51'.2	47'.4	326° 57'.3	12'.8	206° 07'.0	47'.1
10	74° 33'.1	301° 04'.3	10'.7	349° 51'.8	47'.5	341° 59'.2	12'.7	221° 09'.5	47'.1
11	89° 35'.6	316° 03'.7	09'.9	4° 52'.4	47'.6	357° 01'.0	12'.7	236° 12'.0	47'.1
12	104° 38'.0	331° 03'.0	19° 09'.0 N	19° 53'.0	23° 47'.6 N	12° 02'.9	23° 12'.7 N	251° 14'.5	10° 47'.1 S
13	119° 40'.5	346° 02'.4	08'.2	34° 53'.6	47'.7	27° 04'.7	12'.7	266° 16'.9	47'.1
14	134° 42'.9	1° 01'.8	07'.4	49° 54'.2	47'.8	42° 06'.6	12'.7	281° 19'.4	47'.1
15	149° 45'.4	16° 01'.2	06'.6	64° 54'.8	47'.9	57° 08'.4	12'.7	296° 21'.9	47'.2
16	164° 47'.9	31° 00'.6	05'.8	79° 55'.4	48'.0	72° 10'.2	12'.7	311° 24'.4	47'.2
17	179° 50'.3	46° 00'.0	04'.9	94° 56'.0	48'.1	87° 12'.1	12'.7	326° 26'.8	47'.2
18	194° 52'.8	60° 59'.3	04'.1	109° 56'.6	48'.2	102° 13'.9	12'.7	341° 29'.3	47'.2
19	209° 55'.3	75° 58'.7	03'.3	124° 57'.2	48'.3	117° 15'.8	12'.7	356° 31'.8	47'.2
20	224° 57'.7	90° 58'.1	02'.5	139° 57'.8	48'.3	132° 17'.6	12'.7	11° 34'.3	47'.2
21	240° 00'.2	105° 57'.5	01'.6	154° 58'.4	48'.4	147° 19'.5	12'.7	26° 36'.7	47'.2
22	255° 02'.7	120° 56'.9	00'.8	169° 59'.0	48'.5	162° 21'.3	12'.7	41° 39'.2	47'.2
23	270° 05'.1	135° 56'.3	00'.0	184° 59'.6	48'.6	177° 23'.2	12'.7	56° 41'.7	47'.2
7 Sunday 00	285° 07'.6	150° 55'.7	18° 59'.1 N	200° 00'.2	23° 48'.7 N	192° 25'.0	23° 12'.7 N	71° 44'.2	10° 47'.2 S
01	300° 10'.1	165° 55'.0	58'.3	215° 00'.8	48'.8	207° 26'.9	12'.6	86° 46'.6	47'.2
02	315° 12'.5	180° 54'.4	57'.5	230° 01'.4	48'.8	222° 28'.7	12'.6	101° 49'.1	47'.2
03	330° 15'.0	195° 53'.8	56'.6	245° 02'.0	48'.9	237° 30'.6	12'.6	116° 51'.6	47'.3
04	345° 17'.4	210° 53'.2	55'.8	260° 02'.6	49'.0	252° 32'.4	12'.6	131° 54'.0	47'.3
05	0° 19'.9	225° 52'.6	55'.0	275° 03'.2	49'.1	267° 34'.3	12'.6	146° 56'.5	47'.3
06	15° 22'.4	240° 52'.0	54'.1	290° 03'.8	49'.2	282° 36'.1	12'.6	161° 59'.0	47'.3
07	30° 24'.8	255° 51'.4	53'.3	305° 04'.4	49'.3	297° 38'.0	12'.6	177° 01'.5	47'.3
08	45° 27'.3	270° 50'.8	52'.5	320° 05'.0	49'.3	312° 39'.8	12'.6	192° 03'.9	47'.3
09	60° 29'.8	285° 50'.2	51'.6	335° 05'.6	49'.4	327° 41'.7	12'.6	207° 06'.4	47'.3
10	75° 32'.2	300° 49'.6	50'.8	350° 06'.2	49'.5	342° 43'.5	12'.6	222° 08'.9	47'.3
11	90° 34'.7	315° 49'.0	49'.9	5° 06'.8	49'.6	357° 45'.4	12'.6	237° 11'.3	47'.3
12	105° 37'.2	330° 48'.4	18° 49'.1 N	20° 07'.4	23° 49'.7 N	12° 47'.2	23° 12'.6 N	252° 13'.8	10° 47'.3 S
13	120° 39'.6	345° 47'.8	48'.3	35° 08'.0	49'.7	27° 49'.1	12'.6	267° 16'.3	47'.3
14	135° 42'.1	0° 47'.1	47'.4	50° 08'.6	49'.8	42° 50'.9	12'.6	282° 18'.8	47'.4
15	150° 44'.5	15° 46'.5	46'.6	65° 09'.2	49'.9	57° 52'.8	12'.5	297° 21'.2	47'.4
16	165° 47'.0	30° 45'.9	45'.7	80° 09'.8	50'.0	72° 54'.6	12'.5	312° 23'.7	47'.4
17	180° 49'.5	45° 45'.3	44'.9	95° 10'.4	50'.0	87° 56'.5	12'.5	327° 26'.2	47'.4
18	195° 51'.9	60° 44'.7	44'.0	110° 11'.0	50'.1	102° 58'.3	12'.5	342° 28'.6	47'.4
19	210° 54'.4	75° 44'.1	43'.2	125° 11'.6	50'.2	118° 00'.2	12'.5	357° 31'.1	47'.4
20	225° 56'.9	90° 43'.5	42'.3	140° 12'.2	50'.3	133° 02'.0	12'.5	12° 33'.6	47'.4
21	240° 59'.3	105° 42'.9	41'.5	155° 12'.8	50'.3	148° 03'.9	12'.5	27° 36'.0	47'.4
22	256° 01'.8	120° 42'.3	40'.6	170° 13'.4	50'.4	163° 05'.7	12'.5	42° 38'.5	47'.4
23	271° 04'.3	135° 41'.7	39'.8	185° 14'.0	50'.5	178° 07'.6	12'.5	57° 41'.0	47'.4
8 Monday 00	286° 06'.7	150° 41'.1	18° 38'.9 N	200° 14'.6	23° 50'.6 N	193° 09'.4	23° 12'.5 N	72° 43'.5	10° 47'.5 S
01	301° 09'.2	165° 40'.5	38'.1	215° 15'.2	50'.6	208° 11'.3	12'.5	87° 45'.9	47'.5
02	316° 11'.7	180° 39'.9	37'.2	230° 15'.8	50'.7	223° 13'.1	12'.5	102° 48'.4	47'.5
03	331° 14'.1	195° 39'.3	36'.4	245° 16'.4	50'.8	238° 15'.0	12'.5	117° 50'.9	47'.5
04	346° 16'.6	210° 38'.7	35'.5	260° 17'.0	50'.9	253° 16'.8	12'.4	132° 53'.3	47'.5
05	1° 19'.0	225° 38'.2	34'.7	275° 17'.6	50'.9	268° 18'.7	12'.4	147° 55'.8	47'.5
06	16° 21'.5	240° 37'.6	33'.8	290° 18'.2	51'.0	283° 20'.5	12'.4	162° 58'.3	47'.5
07	31° 24'.0	255° 37'.0	33'.0	305° 18'.8	51'.1	298° 22'.4	12'.4	178° 00'.7	47'.5
08	46° 26'.4	270° 36'.4	32'.1	320° 19'.4	51'.2	313° 24'.2	12'.4	193° 03'.2	47'.5
09	61° 28'.9	285° 35'.8	31'.2	335° 20'.0	51'.2	328° 26'.1	12'.4	208° 05'.7	47'.6
10	76° 31'.4	300° 35'.2	30'.4	350° 20'.6	51'.3	343° 27'.9	12'.4	223° 08'.1	47'.6
11	91° 33'.8	315° 34'.6	29'.5	5° 21'.2	51'.4	358° 29'.8	12'.4	238° 10'.6	47'.6
12	106° 36'.3	330° 34'.0	18° 28'.7 N	20° 21'.8	23° 51'.4 N	13° 31'.6	23° 12'.4 N	253° 13'.1	10° 47'.6 S
13	121° 38'.8	345° 33'.4	27'.8	35° 22'.4	51'.5	28° 33'.5	12'.4	268° 15'.5	47'.6
14	136° 41'.2	0° 32'.8	26'.9	50° 23'.0	51'.6	43° 35'.3	12'.4	283° 18'.0	47'.6
15	151° 43'.7	15° 32'.2	26'.1	65° 23'.6	51'.6	58° 37'.2	12'.4	298° 20'.5	47'.6
16	166° 46'.2	30° 31'.6	25'.2	80° 24'.2	51'.7	73° 39'.0	12'.3	313° 22'.9	47'.6
17	181° 48'.6	45° 31'.0	24'.3	95° 24'.8	51'.8	88° 40'.9	12'.3	328° 25'.4	47'.6
18	196° 51'.1	60° 30'.5	23'.5	110° 25'.4	51'.9	103° 42'.7	12'.3	343° 27'.9	47'.6
19	211° 53'.5	75° 29'.9	22'.6	125° 26'.0	51'.9	118° 44'.6	12'.3	358° 30'.3	47'.7
20	226° 56'.0	90° 29'.3	21'.7	140° 26'.6	52'.0	133° 46'.4	12'.3	13° 32'.8	47'.7
21	241° 58'.5	105° 28'.7	20'.9	155° 27'.2	52'.1	148° 48'.3	12'.3	28° 35'.3	47'.7
22	257° 00'.9	120° 28'.1	20'.0	170° 27'.8	52'.1	163° 50'.1	12'.3	43° 37'.7	47'.7
23	272° 03'.4	135° 27'.5	19'.1	185° 28'.4	52'.2	178° 52'.0	12'.3	58° 40'.2	47'.7
	M.P. 04:55	v -0'.6	d 0'.8	v 0'.6	d 0'.1	v 1'.8	d 0'.0	v 2'.5	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.5	40° 14'.9 S
Achernar	335° 26'.9	57° 09'.8 S
Acrux	173° 09'.3	63° 10'.8 S
Adhara	255° 12'.9	28° 59'.6 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.7	55° 53'.4 N
Alkaid	152° 58'.8	49° 15'.0 N
Alnair	27° 43'.4	46° 53'.4 S
Alnilam	275° 46'.6	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.4 N
Alpheratz	357° 43'.3	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.6	42° 13'.7 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.1	69° 03'.1 S
Avior	234° 18'.6	59° 33'.4 S
Bellatrix	278° 32'.3	6° 21'.6 N
Betelgeuse	271° 01'.6	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.3 S
Capella	280° 34'.8	46° 00'.4 N
Deneb	49° 31'.0	45° 19'.8 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.8	17° 54'.6 S
Dubhe	193° 52'.1	61° 40'.8 N
Elnath	278° 12'.9	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.5 N
Enif	33° 46'.8	9° 56'.4 N
Fomalhaut	15° 23'.7	29° 32'.7 S
Gacrux	172° 00'.8	57° 11'.7 S
Gienah	175° 52'.3	17° 37'.2 S
Hadar	148° 47'.5	60° 26'.5 S
Hamal	328° 00'.8	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.6	74° 06'.3 N
Markab	13° 38'.1	15° 16'.8 N
Menkar	314° 15'.2	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.4	69° 46'.7 S
Mirfak	308° 40'.5	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.2 S
Polaris	317° 56'.9	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.3	8° 11'.3 S
Rigil Kent	139° 51'.2	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.3	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.2 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.8	43° 29'.5 S
Vega	80° 38'.5	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	225° 48'.1	13:57
Mars	274° 52'.6	10:40
Jupiter	267° 17'.4	11:09
Saturn	146° 36'.6	19:10

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
6 Saturday 00	178° 49'.6	22° 41'.3 N	205° 47'.4	12'.0	20° 10'.0 N	0'.2	54'.0
01	193° 49'.5	41'.1	220° 18'.4	11'.9	10'.2	0'.0	
02	208° 49'.4	40'.8	234° 49'.3	12'.0	10'.2	0'.0	
03	223° 49'.3	40'.6	249° 20'.3	12'.0	10'.2	0'.1	
04	238° 49'.2	40'.3	263° 51'.3	12'.0	10'.1	0'.2	
05	253° 49'.1	40'.1	278° 22'.3	11'.9	09'.9	0'.4	
06	268° 49'.0	39'.8	292° 53'.2	12'.0	09'.5	0'.4	
07	283° 48'.8	39'.6	307° 24'.2	12'.0	09'.1	0'.5	
08	298° 48'.7	39'.3	321° 55'.2	12'.0	08'.6	0'.6	
09	313° 48'.6	39'.1	336° 26'.2	12'.0	08'.0	0'.7	
10	328° 48'.5	38'.8	350° 57'.2	12'.0	07'.3	0'.7	
11	343° 48'.4	38'.5	5° 28'.2	12'.0	06'.6	0'.9	
12	358° 48'.3	22° 38'.3 N	19° 59'.2	12'.0	20° 05'.7 N	1'.0	54'.0
13	13° 48'.2	38'.0	34° 30'.2	12'.0	04'.7	1'.0	
14	28° 48'.1	37'.8	49° 01'.2	12'.1	03'.7	1'.2	
15	43° 48'.0	37'.5	63° 32'.3	12'.0	02'.5	1'.2	
16	58° 47'.9	37'.2	78° 03'.3	12'.1	01'.3	1'.3	53'.9
17	73° 47'.8	37'.0	92° 34'.4	12'.0	20° 00'.0 N	1'.5	
18	88° 47'.7	36'.7	107° 05'.4	12'.1	58'.5	1'.5	
19	103° 47'.6	36'.5	121° 36'.5	12'.1	57'.0	1'.6	
20	118° 47'.5	36'.2	136° 07'.6	12'.0	55'.4	1'.7	
21	133° 47'.4	35'.9	150° 38'.6	12'.1	53'.7	1'.8	
22	148° 47'.3	35'.7	165° 09'.7	12'.2	51'.9	1'.9	
23	163° 47'.2	35'.4	179° 40'.9	12'.1	50'.0	1'.9	
7 Sunday 00	178° 47'.1	22° 35'.1 N	194° 12'.0	12'.1	19° 48'.1 N	2'.1	53'.9
01	193° 47'.0	34'.9	208° 43'.1	12'.2	46'.0	2'.1	
02	208° 46'.9	34'.6	223° 14'.3	12'.1	43'.9	2'.3	
03	223° 46'.8	34'.3	237° 45'.4	12'.2	41'.6	2'.3	
04	238° 46'.7	34'.1	252° 16'.6	12'.2	39'.3	2'.5	
05	253° 46'.6	33'.8	266° 47'.8	12'.2	36'.8	2'.5	
06	268° 46'.5	33'.5	281° 19'.0	12'.2	34'.3	2'.6	
07	283° 46'.4	33'.2	295° 50'.2	12'.2	31'.7	2'.7	
08	298° 46'.3	33'.0	310° 21'.4	12'.3	29'.0	2'.7	
09	313° 46'.2	32'.7	324° 52'.7	12'.2	26'.3	2'.9	
10	328° 46'.1	32'.4	339° 23'.9	12'.3	23'.4	3'.0	54'.0
11	343° 46'.0	32'.1	353° 55'.2	12'.3	20'.4	3'.0	
12	358° 45'.9	22° 31'.9 N	8° 26'.5	12'.3	19° 17'.4 N	3'.2	54'.0
13	13° 45'.8	31'.6	22° 57'.8	12'.3	14'.2	3'.2	
14	28° 45'.7	31'.3	37° 29'.1	12'.4	11'.0	3'.3	
15	43° 45'.6	31'.0	52° 00'.5	12'.3	07'.7	3'.4	
16	58° 45'.5	30'.8	66° 31'.8	12'.4	04'.3	3'.5	
17	73° 45'.4	30'.5	81° 03'.2	12'.4	00'.8	3'.5	
18	88° 45'.3	30'.2	95° 34'.6	12'.4	18° 57'.3 N	3'.7	
19	103° 45'.2	29'.9	110° 06'.0	12'.5	53'.6	3'.7	
20	118° 45'.1	29'.7	124° 37'.5	12'.4	49'.9	3'.9	
21	133° 45'.0	29'.4	139° 08'.9	12'.5	46'.0	3'.9	
22	148° 44'.9	29'.1	153° 40'.4	12'.5	42'.1	4'.0	
23	163° 44'.8	28'.8	168° 11'.9	12'.5	38'.1	4'.1	
8 Monday 00	178° 44'.7	22° 28'.5 N	182° 43'.4	12'.5	18° 34'.0 N	4'.1	54'.0
01	193° 44'.6	28'.2	197° 14'.9	12'.6	29'.9	4'.3	
02	208° 44'.5	28'.0	211° 46'.5	12'.5	25'.6	4'.3	
03	223° 44'.4	27'.7	226° 18'.0	12'.6	21'.3	4'.4	
04	238° 44'.3	27'.4	240° 49'.6	12'.7	16'.9	4'.5	
05	253° 44'.2	27'.1	255° 21'.3	12'.6	12'.4	4'.6	
06	268° 44'.1	26'.8	269° 52'.9	12'.7	07'.8	4'.7	
07	283° 44'.0	26'.5	284° 24'.6	12'.6	03'.1	4'.7	
08	298° 43'.9	26'.2	298° 56'.2	12'.7	17° 58'.4 N	4'.9	
09	313° 43'.8	26'.0	313° 27'.9	12'.8	53'.5	4'.9	
10	328° 43'.7	25'.7	327° 59'.7	12'.7	48'.6	5'.0	
11	343° 43'.6	25'.4	342° 31'.4	12'.8	43'.6	5'.0	
12	358° 43'.5	22° 25'.1 N	357° 03'.2	12'.8	17° 38'.6 N	5'.2	54'.0
13	13° 43'.4	24'.8	11° 35'.0	12'.8	33'.4	5'.2	
14	28° 43'.3	24'.5	26° 06'.8	12'.9	28'.2	5'.3	54'.1
15	43° 43'.2	24'.2	40° 38'.7	12'.8	22'.9	5'.4	
16	58° 43'.1	23'.9	55° 10'.5	12'.9	17'.5	5'.5	
17	73° 43'.0	23'.6	69° 42'.4	12'.9	12'.0	5'.5	
18	88° 42'.9	23'.3	84° 14'.3	12'.9	06'.5	5'.6	
19	103° 42'.9	23'.0	98° 46'.2	13'.0	00'.9	5'.7	
20	118° 42'.8	22'.7	113° 18'.2	13'.0	16° 55'.2 N	5'.8	
21	133° 42'.7	22'.4	127° 50'.2	13'.0	49'.4	5'.9	
22	148° 42'.6	22'.1	142° 22'.2	13'.0	43'.5	5'.9	
23	163° 42'.5	21'.8	156° 54'.2	13'.1	37'.6	6'.0	
	SD 15'.7	d 0'.3	SD 14'.7		14'.7	14'.7	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8
N 72°	-	-	-	-	-	-
N 70°	-	-	-	23:42	-	01:28
68°	-	-	-	-	00:56	02:13
66°	-	-	00:58	00:37	01:33	02:43
64°	-	-	01:54	01:05	01:59	03:05
62°	-	-	02:26	01:26	02:19	03:22
60°	-	01:20	02:50	01:43	02:36	03:37
N 58°	-	01:59	03:09	01:57	02:50	03:49
56°	-	02:25	03:24	02:10	03:02	04:00
54°	01:14	02:45	03:38	02:21	03:12	04:10
52°	01:49	03:02	03:49	02:30	03:21	04:18
50°	02:14	03:16	04:00	02:39	03:30	04:26
45°	02:56	03:44	04:21	02:57	03:47	04:42
N 40°	03:25	04:06	04:38	03:12	04:02	04:55
35°	03:47	04:23	04:53	03:24	04:14	05:06
30°	04:05	04:38	05:05	03:35	04:25	05:16
20°	04:33	05:02	05:26	03:54	04:43	05:33
N 10°	04:55	05:22	05:44	04:10	04:59	05:47
0°	05:13	05:39	06:01	04:26	05:14	06:01
S 10°	05:29	05:55	06:18	04:41	05:28	06:15
20°	05:45	06:12	06:36	04:58	05:44	06:29
30°	06:00	06:30	06:56	05:16	06:03	06:46
35°	06:09	06:40	07:08	05:27	06:13	06:55
40°	06:17	06:51	07:21	05:40	06:25	07:07
45°	06:27	07:04	07:37	05:55	06:40	07:19
S 50°	06:38	07:19	07:57	06:13	06:57	07:35
52°	06:43	07:26	08:06	06:22	07:05	07:43
54°	06:48	07:34	08:17	06:32	07:15	07:51
56°	06:54	07:43	08:29	06:42	07:25	08:00
58°	07:00	07:52	08:43	06:55	07:37	08:10
S 60°	07:07	08:03	08:59	07:10	07:50	08:22
S 62°	07:15	08:16	09:18	07:27	08:07	08:36

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 6	Moonset 7	Moonset 8
N 72°	-	-	-	-	-	22:57
N 70°	-	-	-	22:24	22:16	22:11
68°	-	-	-	21:10	21:31	21:41
66°	23:07	-	-	20:33	21:01	21:19
64°	22:14	-	-	20:06	20:38	21:01
62°	21:42	-	-	19:46	20:20	20:46
60°	21:19	22:47	-	19:29	20:06	20:34
N 58°	21:00	22:10	-	19:15	19:53	20:23
56°	20:45	21:44	-	19:03	19:42	20:14
54°	20:32	21:24	22:54	18:53	19:32	20:05
52°	20:20	21:07	22:19	18:43	19:23	19:58
50°	20:10	20:53	21:55	18:35	19:16	19:51
45°	19:48	20:25	21:13	18:17	18:59	19:37
N 40°	19:31	20:04	20:45	18:02	18:45	19:25
35°	19:17	19:46	20:23	17:50	18:34	19:14
30°	19:05	19:32	20:05	17:39	18:24	19:05
20°	18:44	19:08	19:37	17:20	18:06	18:50
N 10°	18:25	18:48	19:15	17:04	17:51	18:36
0°	18:09	18:31	18:57	16:49	17:37	18:23
S 10°	17:52	18:15	18:41	16:34	17:22	18:11
20°	17:34	17:58	18:25	16:17	17:07	17:57
30°	17:14	17:40	18:10	15:59	16:49	17:41
35°	17:02	17:30	18:01	15:48	16:39	17:32
40°	16:49	17:19	17:53	15:35	16:27	17:21
45°	16:33	17:06	17:43	15:20	16:13	17:09
S 50°	16:13	16:51	17:32	15:02	15:56	16:54
52°	16:04	16:44	17:27	14:54	15:48	16:47
54°	15:53	16:36	17:22	14:44	15:39	16:39
56°	15:41	16:28	17:16	14:33	15:29	16:30
58°	15:28	16:18	17:10	14:21	15:17	16:20
S 60°	15:12	16:07	17:03	14:06	15:03	16:08
S 62°	14:52	15:55	16:55	13:49	14:48	15:55

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
6	4 41	4 46	12:05	10:37	23:01	28d 3%
7	4 51	4 56	12:05	11:25	23:49	29d 1%
8	5 01	5 06	12:05	12:12	24:35	0d 0%

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2013 July 9, 10, 11 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
9 Tuesday 00	287° 05'.9	150° 26'.9	18° 18'.3 N	200° 29'.0	23° 52'.3 N	193° 53'.8	23° 12'.3 N	73° 42'.7	10° 47'.7 S
01	302° 08'.3	165° 26'.4	17'.4	215° 29'.6	52'.3	208° 55'.7	12'.3	88° 45'.1	47'.7
02	317° 10'.8	180° 25'.8	16'.5	230° 30'.2	52'.4	223° 57'.5	12'.3	103° 47'.6	47'.7
03	332° 13'.3	195° 25'.2	15'.6	245° 30'.8	52'.4	238° 59'.4	12'.2	118° 50'.1	47'.8
04	347° 15'.7	210° 24'.6	14'.8	260° 31'.4	52'.5	254° 01'.2	12'.2	133° 52'.5	47'.8
05	2° 18'.2	225° 24'.0	13'.9	275° 32'.0	52'.6	269° 03'.1	12'.2	148° 55'.0	47'.8
06	17° 20'.7	240° 23'.4	13'.0	290° 32'.6	52'.6	284° 04'.9	12'.2	163° 57'.4	47'.8
07	32° 23'.1	255° 22'.9	12'.1	305° 33'.2	52'.7	299° 06'.8	12'.2	178° 59'.9	47'.8
08	47° 25'.6	270° 22'.3	11'.2	320° 33'.8	52'.8	314° 08'.6	12'.2	194° 02'.4	47'.8
09	62° 28'.0	285° 21'.7	10'.4	335° 34'.4	52'.8	329° 10'.5	12'.2	209° 04'.8	47'.8
10	77° 30'.5	300° 21'.1	09'.5	350° 35'.0	52'.9	344° 12'.3	12'.2	224° 07'.3	47'.8
11	92° 33'.0	315° 20'.5	08'.6	5° 35'.6	53'.0	359° 14'.2	12'.2	239° 09'.8	47'.9
12	107° 35'.4	330° 20'.0	18° 07'.7 N	20° 36'.3	23° 53'.0 N	14° 16'.0	23° 12'.2 N	254° 12'.2	10° 47'.9 S
13	122° 37'.9	345° 19'.4	06'.8	35° 36'.9	53'.1	29° 17'.9	12'.2	269° 14'.7	47'.9
14	137° 40'.4	0° 18'.8	06'.0	50° 37'.5	53'.1	44° 19'.7	12'.1	284° 17'.2	47'.9
15	152° 42'.8	15° 18'.2	05'.1	65° 38'.1	53'.2	59° 21'.6	12'.1	299° 19'.6	47'.9
16	167° 45'.3	30° 17'.7	04'.2	80° 38'.7	53'.3	74° 23'.4	12'.1	314° 22'.1	47'.9
17	182° 47'.8	45° 17'.1	03'.3	95° 39'.3	53'.3	89° 25'.3	12'.1	329° 24'.5	47'.9
18	197° 50'.2	60° 16'.5	02'.4	110° 39'.9	53'.4	104° 27'.1	12'.1	344° 27'.0	47'.9
19	212° 52'.7	75° 15'.9	01'.5	125° 40'.5	53'.4	119° 29'.0	12'.1	359° 29'.5	48'.0
20	227° 55'.2	90° 15'.4	00'.6	140° 41'.1	53'.5	134° 30'.8	12'.1	14° 31'.9	48'.0
21	242° 57'.6	105° 14'.8	17° 59'.7 N	155° 41'.7	53'.5	149° 32'.7	12'.1	29° 34'.4	48'.0
22	258° 00'.1	120° 14'.2	58'.9	170° 42'.3	53'.6	164° 34'.6	12'.1	44° 36'.8	48'.0
23	273° 02'.5	135° 13'.7	58'.0	185° 42'.9	53'.7	179° 36'.4	12'.1	59° 39'.3	48'.0
10 Wednesday 00	288° 05'.0	150° 13'.1	17° 57'.1 N	200° 43'.5	23° 53'.7 N	194° 38'.3	23° 12'.1 N	74° 41'.8	10° 48'.0 S
01	303° 07'.5	165° 12'.5	56'.2	215° 44'.1	53'.8	209° 40'.1	12'.0	89° 44'.2	48'.0
02	318° 09'.9	180° 11'.9	55'.3	230° 44'.7	53'.8	224° 42'.0	12'.0	104° 46'.7	48'.0
03	333° 12'.4	195° 11'.4	54'.4	245° 45'.3	53'.9	239° 43'.8	12'.0	119° 49'.1	48'.1
04	348° 14'.9	210° 10'.8	53'.5	260° 45'.9	53'.9	254° 45'.7	12'.0	134° 51'.6	48'.1
05	3° 17'.3	225° 10'.2	52'.6	275° 46'.5	54'.0	269° 47'.5	12'.0	149° 54'.1	48'.1
06	18° 19'.8	240° 09'.7	51'.7	290° 47'.1	54'.1	284° 49'.4	12'.0	164° 56'.5	48'.1
07	33° 22'.3	255° 09'.1	50'.8	305° 47'.7	54'.1	299° 51'.2	12'.0	179° 59'.0	48'.1
08	48° 24'.7	270° 08'.5	49'.9	320° 48'.3	54'.2	314° 53'.1	12'.0	195° 01'.4	48'.1
09	63° 27'.2	285° 08'.0	49'.0	335° 48'.9	54'.2	329° 54'.9	12'.0	210° 03'.9	48'.1
10	78° 29'.6	300° 07'.4	48'.1	350° 49'.5	54'.3	344° 56'.8	12'.0	225° 06'.4	48'.1
11	93° 32'.1	315° 06'.8	47'.2	5° 50'.1	54'.3	359° 58'.6	11'.9	240° 08'.8	48'.2
12	108° 34'.6	330° 06'.3	17° 46'.3 N	20° 50'.8	23° 54'.4 N	15° 00'.5	23° 11'.9 N	255° 11'.3	10° 48'.2 S
13	123° 37'.0	345° 05'.7	45'.4	35° 51'.4	54'.4	30° 02'.3	11'.9	270° 13'.7	48'.2
14	138° 39'.5	0° 05'.1	44'.5	50° 52'.0	54'.5	45° 04'.2	11'.9	285° 16'.2	48'.2
15	153° 42'.0	15° 04'.6	43'.6	65° 52'.6	54'.5	60° 06'.0	11'.9	300° 18'.7	48'.2
16	168° 44'.4	30° 04'.0	42'.7	80° 53'.2	54'.6	75° 07'.9	11'.9	315° 21'.1	48'.2
17	183° 46'.9	45° 03'.5	41'.8	95° 53'.8	54'.6	90° 09'.7	11'.9	330° 23'.6	48'.2
18	198° 49'.4	60° 02'.9	40'.9	110° 54'.4	54'.7	105° 11'.6	11'.9	345° 26'.0	48'.3
19	213° 51'.8	75° 02'.3	40'.0	125° 55'.0	54'.7	120° 13'.5	11'.9	0° 28'.5	48'.3
20	228° 54'.3	90° 01'.8	39'.1	140° 55'.6	54'.8	135° 15'.3	11'.8	15° 31'.0	48'.3
21	243° 56'.8	105° 01'.2	38'.2	155° 56'.2	54'.8	150° 17'.2	11'.8	30° 33'.4	48'.3
22	258° 59'.2	120° 00'.7	37'.2	170° 56'.8	54'.9	165° 19'.0	11'.8	45° 35'.9	48'.3
23	274° 01'.7	135° 00'.1	36'.3	185° 57'.4	54'.9	180° 20'.9	11'.8	60° 38'.3	48'.3
11 Thursday 00	289° 04'.1	149° 59'.6	17° 35'.4 N	200° 58'.0	23° 55'.0 N	195° 22'.7	23° 11'.8 N	75° 40'.8	10° 48'.3 S
01	304° 06'.6	164° 59'.0	34'.5	215° 58'.6	55'.0	210° 24'.6	11'.8	90° 43'.2	48'.4
02	319° 09'.1	179° 58'.4	33'.6	230° 59'.2	55'.1	225° 26'.4	11'.8	105° 45'.7	48'.4
03	334° 11'.5	194° 57'.9	32'.7	245° 59'.8	55'.1	240° 28'.3	11'.8	120° 48'.2	48'.4
04	349° 14'.0	209° 57'.3	31'.8	261° 00'.4	55'.2	255° 30'.1	11'.8	135° 50'.6	48'.4
05	4° 16'.5	224° 56'.8	30'.9	276° 01'.1	55'.2	270° 32'.0	11'.8	150° 53'.1	48'.4
06	19° 18'.9	239° 56'.2	29'.9	291° 01'.7	55'.3	285° 33'.8	11'.7	165° 55'.5	48'.4
07	34° 21'.4	254° 55'.7	29'.0	306° 02'.3	55'.3	300° 35'.7	11'.7	180° 58'.0	48'.4
08	49° 23'.9	269° 55'.1	28'.1	321° 02'.9	55'.3	315° 37'.5	11'.7	196° 00'.4	48'.5
09	64° 26'.3	284° 54'.6	27'.2	336° 03'.5	55'.4	330° 39'.4	11'.7	211° 02'.9	48'.5
10	79° 28'.8	299° 54'.0	26'.3	351° 04'.1	55'.4	345° 41'.3	11'.7	226° 05'.3	48'.5
11	94° 31'.3	314° 53'.5	25'.3	6° 04'.7	55'.5	0° 43'.1	11'.7	241° 07'.8	48'.5
12	109° 33'.7	329° 52'.9	17° 24'.4 N	21° 05'.3	23° 55'.5 N	15° 45'.0	23° 11'.7 N	256° 10'.3	10° 48'.5 S
13	124° 36'.2	344° 52'.4	23'.5	36° 05'.9	55'.6	30° 46'.8	11'.7	271° 12'.7	48'.5
14	139° 38'.6	359° 51'.8	22'.6	51° 06'.5	55'.6	45° 48'.7	11'.7	286° 15'.2	48'.6
15	154° 41'.1	14° 51'.3	21'.7	66° 07'.1	55'.7	60° 50'.5	11'.6	301° 17'.6	48'.6
16	169° 43'.6	29° 50'.7	20'.7	81° 07'.7	55'.7	75° 52'.4	11'.6	316° 20'.1	48'.6
17	184° 46'.0	44° 50'.2	19'.8	96° 08'.3	55'.7	90° 54'.2	11'.6	331° 22'.5	48'.6
18	199° 48'.5	59° 49'.6	18'.9	111° 08'.9	55'.8	105° 56'.1	11'.6	346° 25'.0	48'.6
19	214° 51'.0	74° 49'.1	17'.9	126° 09'.6	55'.8	120° 57'.9	11'.6	1° 27'.4	48'.6
20	229° 53'.4	89° 48'.5	17'.0	141° 10'.2	55'.9	135° 59'.8	11'.6	16° 29'.9	48'.6
21	244° 55'.9	104° 48'.0	16'.1	156° 10'.8	55'.9	151° 01'.6	11'.6	31° 32'.3	48'.7
22	259° 58'.4	119° 47'.4	15'.2	171° 11'.4	55'.9	166° 03'.5	11'.6	46° 34'.8	48'.7
23	275° 00'.8	134° 46'.9	14'.2	186° 12'.0	56'.0	181° 05'.4	11'.6	61° 37'.2	48'.7
	M.P. 04:43	v -0'.6	d 0'.9	v 0'.6	d 0'.1	v 1'.9	d 0'.0	v 2'.5	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.5	40° 14'.9 S
Achernar	335° 26'.9	57° 09'.8 S
Acrux	173° 09'.3	63° 10'.8 S
Adhara	255° 12'.8	28° 59'.6 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.7	55° 53'.4 N
Alkaid	152° 58'.8	49° 15'.0 N
Alnair	27° 43'.3	46° 53'.4 S
Alnilam	275° 46'.6	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.4 N
Alpheratz	357° 43'.3	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.6	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.1	69° 03'.1 S
Avior	234° 18'.6	59° 33'.4 S
Bellatrix	278° 32'.2	6° 21'.6 N
Betelgeuse	271° 01'.5	7° 24'.4 N
Canopus	263° 56'.7	52° 42'.3 S
Capella	280° 34'.8	46° 00'.4 N
Deneb	49° 31'.0	45° 19'.8 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.8	17° 54'.6 S
Dubhe	193° 52'.1	61° 40'.8 N
Elnath	278° 12'.9	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.5 N
Enif	33° 46'.8	9° 56'.4 N
Fomalhaut	15° 23'.7	29° 32'.7 S
Gacrux	172° 00'.8	57° 11'.6 S
Gienah	175° 52'.3	17° 37'.2 S
Hadar	148° 47'.5	60° 26'.5 S
Hamal	328° 00'.8	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.6	74° 06'.3 N
Markab	13° 38'.1	15° 16'.8 N
Menkar	314° 15'.1	4° 08'.5 N
Menkent	148° 07'.3	36° 26'.3 S
Miaplacidus	221° 40'.4	69° 46'.7 S
Mirfak	308° 40'.5	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.2 S
Polaris	317° 55'.6	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.2 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.3	8° 11'.3 S
Rigil Kent	139° 51'.2	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.3	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.2 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 52'.8	43° 29'.5 S
Vega	80° 38'.5	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	222° 08'.1	14:00
Mars	272° 38'.5	10:37
Jupiter	266° 33'.3	11:00
Saturn	146° 36'.8	18:58

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 42'.4	22° 21'.5 N	171° 26'.3	13'.1	16° 31'.6 N	6'.1	54'.1
193° 42'.3	21'.2	185° 58'.4	13'.1	25'.5	6'.1	
208° 42'.2	20'.9	200° 30'.5	13'.1	19'.4	6'.2	
223° 42'.1	20'.6	215° 02'.6	13'.1	13'.2	6'.3	
238° 42'.0	20'.3	229° 34'.7	13'.2	06'.9	6'.4	54'.2
253° 41'.9	20'.0	244° 06'.9	13'.2	00'.5	6'.4	
268° 41'.8	19'.7	258° 39'.1	13'.2	15° 54'.1 N	6'.5	
283° 41'.7	19'.4	273° 11'.3	13'.3	47'.6	6'.6	
298° 41'.6	19'.1	287° 43'.6	13'.2	41'.0	6'.7	
313° 41'.5	18'.8	302° 15'.8	13'.3	34'.3	6'.7	
328° 41'.4	18'.5	316° 48'.1	13'.4	27'.6	6'.8	
343° 41'.4	18'.2	331° 20'.5	13'.3	20'.8	6'.8	
358° 41'.3	22° 17'.9 N	345° 52'.8	13'.4	15° 14'.0 N	7'.0	54'.2
13° 41'.2	17'.6	0° 25'.2	13'.4	07'.0	7'.0	
28° 41'.1	17'.3	14° 57'.6	13'.4	00'.0	7'.0	
43° 41'.0	17'.0	29° 30'.0	13'.4	14° 53'.0 N	7'.2	
58° 40'.9	16'.7	44° 02'.4	13'.5	45'.8	7'.1	54'.3
73° 40'.8	16'.4	58° 34'.9	13'.5	38'.7	7'.3	
88° 40'.7	16'.0	73° 07'.4	13'.5	31'.4	7'.3	
103° 40'.6	15'.7	87° 39'.9	13'.5	24'.1	7'.4	
118° 40'.5	15'.4	102° 12'.4	13'.5	16'.7	7'.5	
133° 40'.4	15'.1	116° 44'.9	13'.6	09'.2	7'.5	
148° 40'.4	14'.8	131° 17'.5	13'.6	01'.7	7'.6	
163° 40'.3	14'.5	145° 50'.1	13'.6	13° 54'.1 N	7'.6	
178° 40'.2	22° 14'.2 N	160° 22'.7	13'.7	13° 46'.5 N	7'.8	54'.3
193° 40'.1	13'.8	174° 55'.4	13'.6	38'.7	7'.7	54'.4
208° 40'.0	13'.5	189° 28'.0	13'.7	31'.0	7'.9	
223° 39'.9	13'.2	204° 00'.7	13'.7	23'.1	7'.9	
238° 39'.8	12'.9	218° 33'.4	13'.8	15'.2	7'.9	
253° 39'.7	12'.6	233° 06'.2	13'.7	07'.3	8'.0	
268° 39'.6	12'.3	247° 38'.9	13'.8	12° 59'.3 N	8'.1	
283° 39'.6	11'.9	262° 11'.7	13'.8	51'.2	8'.1	
298° 39'.5	11'.6	276° 44'.5	13'.8	43'.1	8'.2	
313° 39'.4	11'.3	291° 17'.3	13'.8	34'.9	8'.3	
328° 39'.3	11'.0	305° 50'.1	13'.8	26'.6	8'.3	54'.5
343° 39'.2	10'.7	320° 22'.9	13'.9	18'.3	8'.3	
358° 39'.1	22° 10'.3 N	334° 55'.8	13'.9	12° 10'.0 N	8'.4	54'.5
13° 39'.0	10'.0	349° 28'.7	13'.9	01'.6	8'.5	
28° 38'.9	09'.7	4° 01'.6	13'.9	11° 53'.1 N	8'.5	
43° 38'.9	09'.4	18° 34'.5	14'.0	44'.6	8'.6	
58° 38'.8	09'.0	33° 07'.5	13'.9	36'.0	8'.6	
73° 38'.7	08'.7	47° 40'.4	14'.0	27'.4	8'.7	54'.6
88° 38'.6	08'.4	62° 13'.4	14'.0	18'.7	8'.8	
103° 38'.5	08'.1	76° 46'.4	14'.0	09'.9	8'.7	
118° 38'.4	07'.7	91° 19'.4	14'.0	01'.2	8'.9	
133° 38'.3	07'.4	105° 52'.4	14'.1	10° 52'.3 N	8'.9	
148° 38'.3	07'.1	120° 25'.5	14'.0	43'.4	8'.9	
163° 38'.2	06'.7	134° 58'.5	14'.1	34'.5	9'.0	
178° 38'.1	22° 06'.4 N	149° 31'.6	14'.1	10° 25'.5 N	9'.0	54'.6
193° 38'.0	06'.1	164° 04'.7	14'.1	16'.5	9'.1	54'.7
208° 37'.9	05'.7	178° 37'.8	14'.1	07'.4	9'.1	
223° 37'.8	05'.4	193° 10'.9	14'.1	9° 58'.3 N	9'.2	
238° 37'.7	05'.1	207° 44'.0	14'.2	49'.1	9'.2	
253° 37'.7	04'.7	222° 17'.2	14'.1	39'.9	9'.3	
268° 37'.6	04'.4	236° 50'.3	14'.2	30'.6	9'.3	
283° 37'.5	04'.1	251° 23'.5	14'.2	21'.3	9'.4	54'.8
298° 37'.4	03'.7	265° 56'.7	14'.1	11'.9	9'.4	
313° 37'.3	03'.4	280° 29'.8	14'.2	02'.5	9'.4	
328° 37'.2	03'.1	295° 03'.0	14'.2	8° 53'.1 N	9'.5	
343° 37'.2	02'.7	309° 36'.2	14'.3	43'.6	9'.6	
358° 37'.1	22° 02'.4 N	324° 09'.5	14'.2	8° 34'.0 N	9'.5	54'.8
13° 37'.0	02'.0	338° 42'.7	14'.2	24'.5	9'.6	54'.9
28° 36'.9	01'.7	353° 15'.9	14'.3	14'.9	9'.7	
43° 36'.8	01'.4	7° 49'.2	14'.2	05'.2	9'.7	
58° 36'.8	01'.0	22° 22'.4	14'.3	7° 55'.5 N	9'.7	
73° 36'.7	00'.7	36° 55'.7	14'.2	45'.8	9'.8	
88° 36'.6	00'.3	51° 28'.9	14'.3	36'.0	9'.8	
103° 36'.5	22° 00'.0 N	66° 02'.2	14'.3	26'.2	9'.8	55'.0
118° 36'.4	59'.7	80° 35'.5	14'.2	16'.4	9'.9	
133° 36'.3	59'.3	95° 08'.7	14'.3	06'.5	9'.9	
148° 36'.3	59'.0	109° 42'.0	14'.3	6° 56'.6 N	10'.0	
163° 36'.2	58'.6	124° 15'.3	14'.3	46'.6	10'.0	
SD 15'.7	d 0'.3	SD	14'.8	14'.8	14'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11
N 72°	-	-	-	02:25	04:23	06:11
N 70°	-	-	-	03:10	04:49	06:26
68°	-	-	-	03:39	05:08	06:38
66°	-	-	01:13	04:01	05:24	06:48
64°	-	-	02:02	04:18	05:36	06:56
62°	-	-	02:32	04:33	05:47	07:03
60°	-	01:29	02:55	04:44	05:56	07:09
N 58°	-	02:05	03:13	04:55	06:04	07:15
56°	-	02:30	03:28	05:04	06:11	07:20
54°	01:22	02:49	03:41	05:12	06:17	07:24
52°	01:55	03:06	03:52	05:19	06:22	07:28
50°	02:18	03:19	04:02	05:25	06:27	07:31
45°	02:59	03:47	04:23	05:39	06:38	07:39
N 40°	03:27	04:08	04:40	05:50	06:47	07:45
35°	03:49	04:25	04:54	06:00	06:55	07:50
30°	04:07	04:39	05:07	06:08	07:01	07:55
20°	04:34	05:03	05:27	06:23	07:13	08:03
N 10°	04:56	05:22	05:45	06:35	07:23	08:10
0°	05:13	05:39	06:02	06:47	07:33	08:17
S 10°	05:29	05:56	06:18	06:59	07:42	08:24
20°	05:45	06:12	06:36	07:12	07:52	08:31
30°	06:00	06:30	06:56	07:26	08:04	08:39
35°	06:08	06:39	07:07	07:34	08:10	08:44
40°	06:17	06:50	07:20	07:44	08:18	08:49
45°	06:26	07:03	07:36	07:55	08:26	08:55
S 50°	06:37	07:18	07:55	08:08	08:37	09:02
52°	06:42	07:25	08:04	08:14	08:42	09:06
54°	06:47	07:32	08:15	08:21	08:47	09:09
56°	06:52	07:40	08:26	08:29	08:53	09:14
58°	06:58	07:50	08:40	08:37	08:59	09:18
S 60°	07:05	08:00	08:55	08:47	09:07	09:23
S 62°	07:13	08:13	09:14	08:58	09:15	09:29

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 9	Moonset 10	Moonset 11
N 72°	-	-	-	22:34	22:19	22:08
N 70°	-	-	-	22:07	22:02	21:58
68°	-	-	-	21:46	21:49	21:50
66°	22:54	-	-	21:30	21:38	21:44
64°	22:07	-	-	21:17	21:29	21:38
62°	21:37	-	-	21:05	21:21	21:33
60°	21:15	22:39	-	20:56	21:14	21:29
N 58°	20:57	22:04	-	20:47	21:07	21:25
56°	20:42	21:40	-	20:40	21:02	21:22
54°	20:29	21:20	22:46	20:33	20:57	21:19
52°	20:18	21:04	22:14	20:27	20:53	21:16
50°	20:08	20:51	21:51	20:22	20:49	21:13
45°	19:47	20:23	21:11	20:10	20:40	21:08
N 40°	19:30	20:02	20:43	20:00	20:33	21:03
35°	19:16	19:45	20:21	19:52	20:26	20:59
30°	19:04	19:31	20:04	19:44	20:21	20:55
20°	18:43	19:08	19:36	19:31	20:11	20:49
N 10°	18:26	18:48	19:15	19:20	20:02	20:44
0°	18:09	18:31	18:57	19:09	19:54	20:38
S 10°	17:53	18:15	18:41	18:59	19:46	20:33
20°	17:35	17:59	18:26	18:47	19:37	20:27
30°	17:15	17:41	18:11	18:34	19:27	20:21
35°	17:04	17:32	18:03	18:26	19:21	20:17
40°	16:51	17:21	17:54	18:17	19:15	20:13
45°	16:35	17:08	17:45	18:07	19:07	20:08
S 50°	16:16	16:53	17:34	17:55	18:58	20:02
52°	16:07	16:46	17:29	17:49	18:53	19:59
54°	15:56	16:39	17:24	17:43	18:49	19:56
56°	15:45	16:31	17:19	17:35	18:43	19:53
58°	15:32	16:21	17:13	17:27	18:37	19:49
S 60°	15:16	16:11	17:06	17:18	18:31	19:45
S 62°	14:57	15:59	16:59	17:07	18:23	19:40

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
9	5 10	5 15	12:05	12:58	00:35	1d 1%
10	5 19	5 23	12:05	13:43	01:21	2d 5%
11	5 27	5 32	12:06	14:28	02:06	3d 9%

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2013 July 12, 13, 14 (Fri, Saty, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
12 Friday 00	290° 03'.3	149° 46'.4	17° 13'.3 N	201° 12'.6	23° 56'.0 N	196° 07'.2	23° 11'.5 N	76° 39'.7	10° 48'.7 S
01	305° 05'.7	164° 45'.8	12'.4	216° 13'.2	56'.1	211° 09'.1	11'.5	91° 42'.2	48'.7
02	320° 08'.2	179° 45'.3	11'.4	231° 13'.8	56'.1	226° 10'.9	11'.5	106° 44'.6	48'.7
03	335° 10'.7	194° 44'.7	10'.5	246° 14'.4	56'.1	241° 12'.8	11'.5	121° 47'.1	48'.8
04	350° 13'.1	209° 44'.2	09'.6	261° 15'.0	56'.2	256° 14'.6	11'.5	136° 49'.5	48'.8
05	5° 15'.6	224° 43'.6	08'.6	276° 15'.6	56'.2	271° 16'.5	11'.5	151° 52'.0	48'.8
06	20° 18'.1	239° 43'.1	07'.7	291° 16'.2	56'.2	286° 18'.3	11'.5	166° 54'.4	48'.8
07	35° 20'.5	254° 42'.6	06'.8	306° 16'.8	56'.3	301° 20'.2	11'.5	181° 56'.9	48'.8
08	50° 23'.0	269° 42'.0	05'.8	321° 17'.5	56'.3	316° 22'.0	11'.4	196° 59'.3	48'.8
09	65° 25'.5	284° 41'.5	04'.9	336° 18'.1	56'.4	331° 23'.9	11'.4	212° 01'.8	48'.8
10	80° 27'.9	299° 40'.9	04'.0	351° 18'.7	56'.4	346° 25'.8	11'.4	227° 04'.2	48'.9
11	95° 30'.4	314° 40'.4	03'.0	6° 19'.3	56'.4	1° 27'.6	11'.4	242° 06'.7	48'.9
12	110° 32'.9	329° 39'.9	17° 02'.1 N	21° 19'.9	23° 56'.5 N	16° 29'.5	23° 11'.4 N	257° 09'.1	10° 48'.9 S
13	125° 35'.3	344° 39'.3	01'.1	36° 20'.5	56'.5	31° 31'.3	11'.4	272° 11'.6	48'.9
14	140° 37'.8	359° 38'.8	00'.2	51° 21'.1	56'.5	46° 33'.2	11'.4	287° 14'.0	48'.9
15	155° 40'.2	14° 38'.3	16° 59'.3 N	66° 21'.7	56'.6	61° 35'.0	11'.4	302° 16'.5	48'.9
16	170° 42'.7	29° 37'.7	58'.3	81° 22'.3	56'.6	76° 36'.9	11'.3	317° 18'.9	49'.0
17	185° 45'.2	44° 37'.2	57'.4	96° 22'.9	56'.6	91° 38'.7	11'.3	332° 21'.4	49'.0
18	200° 47'.6	59° 36'.7	56'.4	111° 23'.5	56'.7	106° 40'.6	11'.3	347° 23'.8	49'.0
19	215° 50'.1	74° 36'.1	55'.5	126° 24'.2	56'.7	121° 42'.5	11'.3	2° 26'.3	49'.0
20	230° 52'.6	89° 35'.6	54'.5	141° 24'.8	56'.7	136° 44'.3	11'.3	17° 28'.7	49'.0
21	245° 55'.0	104° 35'.1	53'.6	156° 25'.4	56'.8	151° 46'.2	11'.3	32° 31'.2	49'.0
22	260° 57'.5	119° 34'.5	52'.6	171° 26'.0	56'.8	166° 48'.0	11'.3	47° 33'.6	49'.1
23	276° 00'.0	134° 34'.0	51'.7	186° 26'.6	56'.8	181° 49'.9	11'.3	62° 36'.1	49'.1
13 Saturday 00	291° 02'.4	149° 33'.5	16° 50'.7 N	201° 27'.2	23° 56'.8 N	196° 51'.7	23° 11'.3 N	77° 38'.5	10° 49'.1 S
01	306° 04'.9	164° 33'.0	49'.8	216° 27'.8	56'.9	211° 53'.6	11'.2	92° 41'.0	49'.1
02	321° 07'.4	179° 32'.4	48'.8	231° 28'.4	56'.9	226° 55'.4	11'.2	107° 43'.4	49'.1
03	336° 09'.8	194° 31'.9	47'.9	246° 29'.0	56'.9	241° 57'.3	11'.2	122° 45'.9	49'.2
04	351° 12'.3	209° 31'.4	46'.9	261° 29'.6	57'.0	256° 59'.2	11'.2	137° 48'.3	49'.2
05	6° 14'.7	224° 30'.8	46'.0	276° 30'.3	57'.0	272° 01'.0	11'.2	152° 50'.8	49'.2
06	21° 17'.2	239° 30'.3	45'.0	291° 30'.9	57'.0	287° 02'.9	11'.2	167° 53'.2	49'.2
07	36° 19'.7	254° 29'.8	44'.1	306° 31'.5	57'.1	302° 04'.7	11'.2	182° 55'.7	49'.2
08	51° 22'.1	269° 29'.3	43'.1	321° 32'.1	57'.1	317° 06'.6	11'.1	197° 58'.1	49'.2
09	66° 24'.6	284° 28'.7	42'.2	336° 32'.7	57'.1	332° 08'.4	11'.1	213° 00'.6	49'.3
10	81° 27'.1	299° 28'.2	41'.2	351° 33'.3	57'.1	347° 10'.3	11'.1	228° 03'.0	49'.3
11	96° 29'.5	314° 27'.7	40'.3	6° 33'.9	57'.2	2° 12'.1	11'.1	243° 05'.5	49'.3
12	111° 32'.0	329° 27'.2	16° 39'.3 N	21° 34'.5	23° 57'.2 N	17° 14'.0	23° 11'.1 N	258° 07'.9	10° 49'.3 S
13	126° 34'.5	344° 26'.6	38'.3	36° 35'.1	57'.2	32° 15'.9	11'.1	273° 10'.3	49'.3
14	141° 36'.9	359° 26'.1	37'.4	51° 35'.7	57'.2	47° 17'.7	11'.1	288° 12'.8	49'.3
15	156° 39'.4	14° 25'.6	36'.4	66° 36'.4	57'.3	62° 19'.6	11'.1	303° 15'.2	49'.4
16	171° 41'.8	29° 25'.1	35'.5	81° 37'.0	57'.3	77° 21'.4	11'.0	318° 17'.7	49'.4
17	186° 44'.3	44° 24'.6	34'.5	96° 37'.6	57'.3	92° 23'.3	11'.0	333° 20'.1	49'.4
18	201° 46'.8	59° 24'.0	33'.5	111° 38'.2	57'.3	107° 25'.1	11'.0	348° 22'.6	49'.4
19	216° 49'.2	74° 23'.5	32'.6	126° 38'.8	57'.4	122° 27'.0	11'.0	3° 25'.0	49'.4
20	231° 51'.7	89° 23'.0	31'.6	141° 39'.4	57'.4	137° 28'.9	11'.0	18° 27'.5	49'.5
21	246° 54'.2	104° 22'.5	30'.6	156° 40'.0	57'.4	152° 30'.7	11'.0	33° 29'.9	49'.5
22	261° 56'.6	119° 22'.0	29'.7	171° 40'.6	57'.4	167° 32'.6	11'.0	48° 32'.4	49'.5
23	276° 59'.1	134° 21'.5	28'.7	186° 41'.3	57'.4	182° 34'.4	11'.0	63° 34'.8	49'.5
14 Sunday 00	292° 01'.6	149° 20'.9	16° 27'.7 N	201° 41'.9	23° 57'.5 N	197° 36'.3	23° 10'.9 N	78° 37'.3	10° 49'.5 S
01	307° 04'.0	164° 20'.4	26'.8	216° 42'.5	57'.5	212° 38'.1	10'.9	93° 39'.7	49'.5
02	322° 06'.5	179° 19'.9	25'.8	231° 43'.1	57'.5	227° 40'.0	10'.9	108° 42'.1	49'.6
03	337° 09'.0	194° 19'.4	24'.8	246° 43'.7	57'.5	242° 41'.9	10'.9	123° 44'.6	49'.6
04	352° 11'.4	209° 18'.9	23'.9	261° 44'.3	57'.6	257° 43'.7	10'.9	138° 47'.0	49'.6
05	7° 13'.9	224° 18'.4	22'.9	276° 44'.9	57'.6	272° 45'.6	10'.9	153° 49'.5	49'.6
06	22° 16'.3	239° 17'.9	21'.9	291° 45'.5	57'.6	287° 47'.4	10'.9	168° 51'.9	49'.6
07	37° 18'.8	254° 17'.3	20'.9	306° 46'.2	57'.6	302° 49'.3	10'.8	183° 54'.4	49'.7
08	52° 21'.3	269° 16'.8	20'.0	321° 46'.8	57'.6	317° 51'.1	10'.8	198° 56'.8	49'.7
09	67° 23'.7	284° 16'.3	19'.0	336° 47'.4	57'.6	332° 53'.0	10'.8	213° 59'.3	49'.7
10	82° 26'.2	299° 15'.8	18'.0	351° 48'.0	57'.7	347° 54'.9	10'.8	229° 01'.7	49'.7
11	97° 28'.7	314° 15'.3	17'.0	6° 48'.6	57'.7	2° 56'.7	10'.8	244° 04'.1	49'.7
12	112° 31'.1	329° 14'.8	16° 16'.1 N	21° 49'.2	23° 57'.7 N	17° 58'.6	23° 10'.8 N	259° 06'.6	10° 49'.8 S
13	127° 33'.6	344° 14'.3	15'.1	36° 49'.8	57'.7	33° 00'.4	10'.8	274° 09'.0	49'.8
14	142° 36'.1	359° 13'.8	14'.1	51° 50'.4	57'.7	48° 02'.3	10'.7	289° 11'.5	49'.8
15	157° 38'.5	14° 13'.3	13'.1	66° 51'.1	57'.8	63° 04'.2	10'.7	304° 13'.9	49'.8
16	172° 41'.0	29° 12'.8	12'.2	81° 51'.7	57'.8	78° 06'.0	10'.7	319° 16'.4	49'.8
17	187° 43'.4	44° 12'.3	11'.2	96° 52'.3	57'.8	93° 07'.9	10'.7	334° 18'.8	49'.8
18	202° 45'.9	59° 11'.8	10'.2	111° 52'.9	57'.8	108° 09'.7	10'.7	349° 21'.2	49'.9
19	217° 48'.4	74° 11'.2	09'.2	126° 53'.5	57'.8	123° 11'.6	10'.7	4° 23'.7	49'.9
20	232° 50'.8	89° 10'.7	08'.2	141° 54'.1	57'.8	138° 13'.4	10'.7	19° 26'.1	49'.9
21	247° 53'.3	104° 10'.2	07'.3	156° 54'.7	57'.8	153° 15'.3	10'.6	34° 28'.6	49'.9
22	262° 55'.8	119° 09'.7	06'.3	171° 55'.3	57'.9	168° 17'.2	10'.6	49° 31'.0	49'.9
23	277° 58'.2	134° 09'.2	05'.3	186° 56'.0	57'.9	183° 19'.0	10'.6	64° 33'.4	50'.0
	M.P. 04:31	v -0'.5	d 1'.0	v 0'.6	d 0'.0	v 1'.9	d 0'.0	v 2'.4	d 0'.0

STARS		
Name	SHA	Dec
Acamar	315° 18'.5	40° 14'.8 S
Achernar	335° 26'.8	57° 09'.8 S
Acrux	173° 09'.3	63° 10'.8 S
Adhara	255° 12'.8	28° 59'.6 S
Aldebaran	290° 49'.6	16° 32'.0 N
Alioth	166° 20'.7	55° 53'.4 N
Alkaid	152° 58'.8	49° 15'.0 N
Alnair	27° 43'.3	46° 53'.4 S
Alnilam	275° 46'.6	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.7	26° 40'.4 N
Alpheratz	357° 43'.3	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.6	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.1	69° 03'.1 S
Avior	234° 18'.6	59° 33'.4 S
Bellatrix	278° 32'.2	6° 21'.6 N
Betelgeuse	271° 01'.5	7° 24'.4 N
Canopus	263° 56'.6	52° 42'.2 S
Capella	280° 34'.7	46° 00'.4 N
Deneb	49° 30'.9	45° 19'.8 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.8	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.8 N
Elnath	278° 12'.9	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.5 N
Enif	33° 46'.8	9° 56'.4 N
Fomalhaut	15° 23'.7	29° 32'.7 S
Gacrux	172° 00'.9	57° 11'.6 S
Gienah	175° 52'.3	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.5 S
Hamal	328° 00'.7	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.7	74° 06'.3 N
Markab	13° 38'.1	15° 16'.8 N
Menkar	314° 15'.1	4° 08'.5 N
Menkent	148° 07'.4	36° 26'.3 S
Miaplacidus	221° 40'.4	69° 46'.7 S
Mirfak	308° 40'.5	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.2 S
Polaris	317° 54'.3	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.3	8° 11'.2 S
Rigil Kent	139° 51'.3	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.3	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.5 S
Vega	80° 38'.5	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.9 S
	SHA	Mer.Pass.
Venus	218° 31'.1	14:02
Mars	270° 24'.8	10:34
Jupiter	265° 49'.3	10:51
Saturn	146° 36'.1	18:46

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 36'.1	21° 58'.3 N	138° 48'.6	14'.3	6° 36'.6 N	10'.0	55'.1
193° 36'.0	57'.9	153° 21'.9	14'.3	26'.6	10'.1	
208° 35'.9	57'.6	167° 55'.2	14'.2	16'.5	10'.0	
223° 35'.9	57'.2	182° 28'.4	14'.3	06'.5	10'.2	
238° 35'.8	56'.9	197° 01'.7	14'.3	5° 56'.3 N	10'.1	
253° 35'.7	56'.5	211° 35'.0	14'.3	46'.2	10'.2	
268° 35'.6	56'.2	226° 08'.3	14'.3	36'.0	10'.2	55'.2
283° 35'.6	55'.8	240° 41'.6	14'.3	25'.8	10'.3	
298° 35'.5	55'.5	255° 14'.9	14'.3	15'.5	10'.2	
313° 35'.4	55'.1	269° 48'.2	14'.2	05'.3	10'.3	
328° 35'.3	54'.8	284° 21'.4	14'.3	4° 55'.0 N	10'.4	
343° 35'.2	54'.4	298° 54'.7	14'.3	44'.6	10'.3	55'.3
358° 35'.2	21° 54'.1 N	313° 28'.0	14'.2	4° 34'.3 N	10'.4	55'.3
13° 35'.1	53'.7	328° 01'.2	14'.3	23'.9	10'.4	
28° 35'.0	53'.4	342° 34'.5	14'.2	13'.5	10'.4	
43° 34'.9	53'.0	357° 07'.7	14'.3	03'.1	10'.5	55'.4
58° 34'.9	52'.6	11° 41'.0	14'.2	3° 52'.6 N	10'.5	
73° 34'.8	52'.3	26° 14'.2	14'.2	42'.1	10'.5	
88° 34'.7	51'.9	40° 47'.4	14'.3	31'.6	10'.5	
103° 34'.6	51'.6	55° 20'.7	14'.2	21'.1	10'.5	
118° 34'.5	51'.2	69° 53'.9	14'.2	10'.6	10'.6	55'.5
133° 34'.5	50'.8	84° 27'.1	14'.1	3° 00'.0 N	10'.6	
148° 34'.4	50'.5	99° 00'.2	14'.2	49'.4	10'.6	
163° 34'.3	50'.1	113° 33'.4	14'.2	38'.8	10'.6	
178° 34'.2	21° 49'.8 N	128° 06'.6	14'.1	2° 28'.2 N	10'.7	55'.6
193° 34'.2	49'.4	142° 39'.7	14'.1	17'.5	10'.6	
208° 34'.1	49'.0	157° 12'.8	14'.1	06'.9	10'.7	
223° 34'.0	48'.7	171° 45'.9	14'.1	1° 56'.2 N	10'.7	
238° 33'.9	48'.3	186° 19'.0	14'.1	45'.5	10'.7	
253° 33'.9	47'.9	200° 52'.1	14'.1	34'.8	10'.8	55'.7
268° 33'.8	47'.6	215° 25'.2	14'.0	24'.0	10'.7	
283° 33'.7	47'.2	229° 58'.2	14'.0	13'.3	10'.8	
298° 33'.7	46'.8	244° 31'.2	14'.0	02'.5	10'.7	
313° 33'.6	46'.5	259° 04'.2	14'.0	0° 51'.8 N	10'.8	55'.8
328° 33'.5	46'.1	273° 37'.2	14'.0	41'.0	10'.8	
343° 33'.4	45'.7	288° 10'.2	13'.9	30'.2	10'.8	
358° 33'.4	21° 45'.4 N	302° 43'.1	13'.9	0° 19'.4 N	10'.8	55'.8
13° 33'.3	45'.0	317° 16'.0	13'.9	08'.6	10'.8	55'.9
28° 33'.2	44'.6	331° 48'.9	13'.9	0° 02'.2 S	10'.9	
43° 33'.1	44'.3	346° 21'.8	13'.8	13'.1	10'.8	
58° 33'.1	43'.9	0° 54'.6	13'.8	23'.9	10'.9	
73° 33'.0	43'.5	15° 27'.4	13'.8	34'.8	10'.8	56'.0
88° 32'.9	43'.1	30° 00'.2	13'.7	45'.6	10'.9	
103° 32'.9	42'.8	44° 32'.9	13'.8	56'.5	10'.8	
118° 32'.8	42'.4	59° 05'.7	13'.7	1° 07'.3 S	10'.9	
133° 32'.7	42'.0	73° 38'.4	13'.6	18'.2	10'.9	56'.1
148° 32'.6	41'.6	88° 11'.0	13'.7	29'.1	10'.9	
163° 32'.6	41'.3	102° 43'.7	13'.6	40'.0	10'.8	
178° 32'.5	21° 40'.9 N	117° 16'.3	13'.5	1° 50'.8 S	10'.9	56'.2
193° 32'.4	40'.5	131° 48'.8	13'.6	2° 01'.7 S	10'.9	
208° 32'.4	40'.1	146° 21'.4	13'.5	12'.6	10'.9	
223° 32'.3	39'.7	160° 53'.9	13'.4	23'.5	10'.9	
238° 32'.2	39'.4	175° 26'.3	13'.5	34'.4	10'.8	56'.3
253° 32'.2	39'.0	189° 58'.8	13'.3	45'.2	10'.9	
268° 32'.1	38'.6	204° 31'.1	13'.4	56'.1	10'.9	
283° 32'.0	38'.2	219° 03'.5	13'.3	3° 07'.0 S	10'.8	
298° 32'.0	37'.8	233° 35'.8	13'.3	17'.8	10'.9	56'.4
313° 31'.9	37'.4	248° 08'.1	13'.2	28'.7	10'.9	
328° 31'.8	37'.1	262° 40'.3	13'.2	39'.6	10'.8	
343° 31'.8	36'.7	277° 12'.5	13'.1	50'.4	10'.9	56'.5
358° 31'.7	21° 36'.3 N	291° 44'.6	13'.2	4° 01'.3 S	10'.8	56'.5
13° 31'.6	35'.9	306° 16'.8	13'.0	12'.1	10'.8	
28° 31'.6	35'.5	320° 48'.8	13'.0	22'.9	10'.8	
43° 31'.5	35'.1	335° 20'.8	13'.0	33'.7	10'.8	56'.6
58° 31'.4	34'.7	349° 52'.8	12'.9	44'.5	10'.8	
73° 31'.4	34'.4	4° 24'.7	12'.9	55'.3	10'.8	
88° 31'.3	34'.0	18° 56'.6	12'.8	5° 06'.1 S	10'.8	56'.7
103° 31'.2	33'.6	33° 28'.4	12'.8	16'.9	10'.7	
118° 31'.2	33'.2	48° 00'.2	12'.7	27'.6	10'.8	
133° 31'.1	32'.8	62° 31'.9	12'.7	38'.4	10'.7	56'.8
148° 31'.0	32'.4	77° 03'.6	12'.6	49'.1	10'.7	
163° 31'.0	32'.0	91° 35'.2	12'.6	59'.8	10'.7	
SD 15'.7	d 0'.4	SD	15'.1	15'.2	15'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14
N 72°	-	-	-	07:54	09:37	11:22
N 70°	-	-	-	08:02	09:38	11:16
68°	-	-	-	08:08	09:39	11:11
66°	-	-	01:27	08:13	09:39	11:07
64°	-	-	02:10	08:17	09:40	11:04
62°	-	00:33	02:38	08:21	09:40	11:01
60°	-	01:39	03:00	08:24	09:41	10:59
N 58°	-	02:12	03:17	08:27	09:41	10:57
56°	00:30	02:35	03:32	08:30	09:41	10:55
54°	01:31	02:54	03:45	08:32	09:42	10:53
52°	02:01	03:10	03:56	08:34	09:42	10:51
50°	02:23	03:23	04:05	08:36	09:42	10:50
45°	03:03	03:50	04:26	08:40	09:43	10:47
N 40°	03:30	04:10	04:42	08:44	09:43	10:44
35°	03:51	04:27	04:56	08:46	09:44	10:42
30°	04:08	04:41	05:08	08:49	09:44	10:40
20°	04:35	05:04	05:28	08:54	09:44	10:36
N 10°	04:56	05:23	05:46	08:58	09:45	10:33
0°	05:14	05:40	06:02	09:01	09:46	10:31
S 10°	05:30	05:56	06:18	09:05	09:46	10:28
20°	05:44	06:12	06:35	09:09	09:47	10:25
30°	05:59	06:29	06:55	09:13	09:47	10:22
35°	06:07	06:39	07:06	09:16	09:48	10:20
40°	06:16	06:49	07:19	09:19	09:48	10:18
45°	06:25	07:01	07:34	09:22	09:49	10:16
S 50°	06:35	07:16	07:53	09:26	09:49	10:13
52°	06:40	07:23	08:02	09:28	09:50	10:11
54°	06:45	07:30	08:12	09:30	09:50	10:10
56°	06:50	07:38	08:23	09:32	09:50	10:09
58°	06:56	07:47	08:36	09:35	09:51	10:07
S 60°	07:02	07:57	08:51	09:37	09:51	10:05
S 62°	07:10	08:09	09:09	09:41	09:52	10:03

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 12	Moonset 13	Moonset 14
N 72°	-	-	-	21:58	21:48	21:37
N 70°	-	-	-	21:54	21:50	21:45
68°	-	-	-	21:51	21:51	21:52
66°	22:41	-	-	21:48	21:53	21:58
64°	21:59	-	-	21:46	21:54	22:02
62°	21:31	23:29	-	21:44	21:55	22:07
60°	21:10	22:30	-	21:43	21:56	22:10
N 58°	20:53	21:58	-	21:41	21:57	22:13
56°	20:39	21:35	23:33	21:40	21:58	22:16
54°	20:26	21:16	22:38	21:39	21:58	22:19
52°	20:15	21:01	22:09	21:37	21:59	22:21
50°	20:05	20:48	21:47	21:36	21:59	22:23
45°	19:45	20:21	21:08	21:34	22:01	22:28
N 40°	19:29	20:01	20:41	21:32	22:02	22:32
35°	19:15	19:44	20:20	21:31	22:03	22:36
30°	19:03	19:30	20:03	21:29	22:03	22:39
20°	18:43	19:07	19:36	21:27	22:05	22:44
N 10°	18:26	18:48	19:15	21:25	22:06	22:49
0°	18:09	18:32	18:58	21:22	22:07	22:53
S 10°	17:53	18:16	18:42	21:20	22:08	22:57
20°	17:36	18:00	18:27	21:18	22:09	23:02
30°	17:17	17:43	18:12	21:15	22:11	23:07
35°	17:06	17:33	18:04	21:14	22:11	23:10
40°	16:53	17:23	17:56	21:12	22:12	23:14
45°	16:37	17:10	17:47	21:10	22:13	23:18
S 50°	16:19	16:56	17:37	21:08	22:14	23:23
52°	16:10	16:49	17:32	21:06	22:15	23:25
54°	16:00	16:42	17:27	21:05	22:15	23:27
56°	15:49	16:34	17:22	21:04	22:16	23:30
58°	15:36	16:25	17:16	21:02	22:17	23:33
S 60°	15:21	16:15	17:10	21:01	22:18	23:37
S 62°	15:03	16:03	17:03	20:59	22:18	23:40

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
12	5 35	5 39	12:06	15:12	02:50	4d 16%
13	5 43	5 46	12:06	15:56	03:34	5d 24%
14	5 50	5 53	12:06	16:42	04:19	6d 33%

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2013 July 15, 16, 17 (Mon, Tue, Wed)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
15 Monday 00	293° 00'.7	149° 08'.7	16° 04'.3 N	201° 56'.6	23° 57'.9 N	198° 20'.9	23° 10'.6 N	79° 35'.9	10° 50'.0 S
01	308° 03'.2	164° 08'.2	03'.3	216° 57'.2	57'.9	213° 22'.7	10'.6	94° 38'.3	50'.0
02	323° 05'.6	179° 07'.7	02'.3	231° 57'.8	57'.9	228° 24'.6	10'.6	109° 40'.8	50'.0
03	338° 08'.1	194° 07'.2	01'.3	246° 58'.4	57'.9	243° 26'.5	10'.6	124° 43'.2	50'.0
04	353° 10'.6	209° 06'.7	00'.4	261° 59'.0	57'.9	258° 28'.3	10'.5	139° 45'.7	50'.1
05	8° 13'.0	224° 06'.2	15° 59'.4 N	276° 59'.6	57'.9	273° 30'.2	10'.5	154° 48'.1	50'.1
06	23° 15'.5	239° 05'.7	58'.4	292° 00'.3	58'.0	288° 32'.0	10'.5	169° 50'.5	50'.1
07	38° 17'.9	254° 05'.2	57'.4	307° 00'.9	58'.0	303° 33'.9	10'.5	184° 53'.0	50'.1
08	53° 20'.4	269° 04'.7	56'.4	322° 01'.5	58'.0	318° 35'.7	10'.5	199° 55'.4	50'.1
09	68° 22'.9	284° 04'.2	55'.4	337° 02'.1	58'.0	333° 37'.6	10'.5	214° 57'.9	50'.2
10	83° 25'.3	299° 03'.7	54'.4	352° 02'.7	58'.0	348° 39'.5	10'.5	230° 00'.3	50'.2
11	98° 27'.8	314° 03'.2	53'.4	7° 03'.3	58'.0	3° 41'.3	10'.4	245° 02'.7	50'.2
12	113° 30'.3	329° 02'.7	15° 52'.4 N	22° 04'.0	23° 58'.0 N	18° 43'.2	23° 10'.4 N	260° 05'.2	10° 50'.2 S
13	128° 32'.7	344° 02'.3	51'.4	37° 04'.6	58'.0	33° 45'.0	10'.4	275° 07'.6	50'.2
14	143° 35'.2	359° 01'.8	50'.4	52° 05'.2	58'.0	48° 46'.9	10'.4	290° 10'.0	50'.3
15	158° 37'.7	14° 01'.3	49'.5	67° 05'.8	58'.0	63° 48'.8	10'.4	305° 12'.5	50'.3
16	173° 40'.1	29° 00'.8	48'.5	82° 06'.4	58'.0	78° 50'.6	10'.4	320° 14'.9	50'.3
17	188° 42'.6	44° 00'.3	47'.5	97° 07'.0	58'.0	93° 52'.5	10'.4	335° 17'.4	50'.3
18	203° 45'.1	58° 59'.8	46'.5	112° 07'.6	58'.1	108° 54'.3	10'.3	350° 19'.8	50'.4
19	218° 47'.5	73° 59'.3	45'.5	127° 08'.3	58'.1	123° 56'.2	10'.3	5° 22'.2	50'.4
20	233° 50'.0	88° 58'.8	44'.5	142° 08'.9	58'.1	138° 58'.1	10'.3	20° 24'.7	50'.4
21	248° 52'.4	103° 58'.3	43'.5	157° 09'.5	58'.1	153° 59'.9	10'.3	35° 27'.1	50'.4
22	263° 54'.9	118° 57'.8	42'.5	172° 10'.1	58'.1	169° 01'.8	10'.3	50° 29'.6	50'.4
23	278° 57'.4	133° 57'.3	41'.5	187° 10'.7	58'.1	184° 03'.6	10'.3	65° 32'.0	50'.5
16 Tuesday 00	293° 59'.8	148° 56'.8	15° 40'.5 N	202° 11'.3	23° 58'.1 N	199° 05'.5	23° 10'.2 N	80° 34'.4	10° 50'.5 S
01	309° 02'.3	163° 56'.4	39'.5	217° 12'.0	58'.1	214° 07'.4	10'.2	95° 36'.9	50'.5
02	324° 04'.8	178° 55'.9	38'.5	232° 12'.6	58'.1	229° 09'.2	10'.2	110° 39'.3	50'.5
03	339° 07'.2	193° 55'.4	37'.5	247° 13'.2	58'.1	244° 11'.1	10'.2	125° 41'.7	50'.5
04	354° 09'.7	208° 54'.9	36'.4	262° 13'.8	58'.1	259° 12'.9	10'.2	140° 44'.2	50'.6
05	9° 12'.2	223° 54'.4	35'.4	277° 14'.4	58'.1	274° 14'.8	10'.2	155° 46'.6	50'.6
06	24° 14'.6	238° 53'.9	34'.4	292° 15'.0	58'.1	289° 16'.7	10'.2	170° 49'.0	50'.6
07	39° 17'.1	253° 53'.4	33'.4	307° 15'.7	58'.1	304° 18'.5	10'.1	185° 51'.5	50'.6
08	54° 19'.5	268° 53'.0	32'.4	322° 16'.3	58'.1	319° 20'.4	10'.1	200° 53'.9	50'.6
09	69° 22'.0	283° 52'.5	31'.4	337° 16'.9	58'.1	334° 22'.2	10'.1	215° 56'.4	50'.7
10	84° 24'.5	298° 52'.0	30'.4	352° 17'.5	58'.1	349° 24'.1	10'.1	230° 58'.8	50'.7
11	99° 26'.9	313° 51'.5	29'.4	7° 18'.1	58'.1	4° 26'.0	10'.1	246° 01'.2	50'.7
12	114° 29'.4	328° 51'.0	15° 28'.4 N	22° 18'.7	23° 58'.1 N	19° 27'.8	23° 10'.1 N	261° 03'.7	10° 50'.7 S
13	129° 31'.9	343° 50'.5	27'.4	37° 19'.4	58'.1	34° 29'.7	10'.0	276° 06'.1	50'.8
14	144° 34'.3	358° 50'.1	26'.4	52° 20'.0	58'.1	49° 31'.6	10'.0	291° 08'.5	50'.8
15	159° 36'.8	13° 49'.6	25'.4	67° 20'.6	58'.1	64° 33'.4	10'.0	306° 11'.0	50'.8
16	174° 39'.3	28° 49'.1	24'.3	82° 21'.2	58'.1	79° 35'.3	10'.0	321° 13'.4	50'.8
17	189° 41'.7	43° 48'.6	23'.3	97° 21'.8	58'.1	94° 37'.1	10'.0	336° 15'.8	50'.8
18	204° 44'.2	58° 48'.1	22'.3	112° 22'.5	58'.1	109° 39'.0	10'.0	351° 18'.3	50'.9
19	219° 46'.7	73° 47'.7	21'.3	127° 23'.1	58'.1	124° 40'.9	10'.0	6° 20'.7	50'.9
20	234° 49'.1	88° 47'.2	20'.3	142° 23'.7	58'.1	139° 42'.7	09'.9	21° 23'.1	50'.9
21	249° 51'.6	103° 46'.7	19'.3	157° 24'.3	58'.1	154° 44'.6	09'.9	36° 25'.6	50'.9
22	264° 54'.0	118° 46'.2	18'.2	172° 24'.9	58'.1	169° 46'.4	09'.9	51° 28'.0	51'.0
23	279° 56'.5	133° 45'.8	17'.2	187° 25'.5	58'.1	184° 48'.3	09'.9	66° 30'.4	51'.0
17 Wednesday 00	294° 59'.0	148° 45'.3	15° 16'.2 N	202° 26'.2	23° 58'.1 N	199° 50'.2	23° 09'.9 N	81° 32'.9	10° 51'.0 S
01	310° 01'.4	163° 44'.8	15'.2	217° 26'.8	58'.1	214° 52'.0	09'.9	96° 35'.3	51'.0
02	325° 03'.9	178° 44'.3	14'.2	232° 27'.4	58'.1	229° 53'.9	09'.8	111° 37'.7	51'.0
03	340° 06'.4	193° 43'.9	13'.2	247° 28'.0	58'.1	244° 55'.8	09'.8	126° 40'.2	51'.1
04	355° 08'.8	208° 43'.4	12'.1	262° 28'.6	58'.1	259° 57'.6	09'.8	141° 42'.6	51'.1
05	10° 11'.3	223° 42'.9	11'.1	277° 29'.3	58'.1	274° 59'.5	09'.8	156° 45'.0	51'.1
06	25° 13'.8	238° 42'.4	10'.1	292° 29'.9	58'.0	290° 01'.3	09'.8	171° 47'.5	51'.1
07	40° 16'.2	253° 42'.0	09'.1	307° 30'.5	58'.0	305° 03'.2	09'.8	186° 49'.9	51'.2
08	55° 18'.7	268° 41'.5	08'.0	322° 31'.1	58'.0	320° 05'.1	09'.7	201° 52'.3	51'.2
09	70° 21'.2	283° 41'.0	07'.0	337° 31'.7	58'.0	335° 06'.9	09'.7	216° 54'.8	51'.2
10	85° 23'.6	298° 40'.6	06'.0	352° 32'.4	58'.0	350° 08'.8	09'.7	231° 57'.2	51'.2
11	100° 26'.1	313° 40'.1	05'.0	7° 33'.0	58'.0	5° 10'.6	09'.7	246° 59'.6	51'.3
12	115° 28'.5	328° 39'.6	15° 03'.9 N	22° 33'.6	23° 58'.0 N	20° 12'.5	23° 09'.7 N	262° 02'.1	10° 51'.3 S
13	130° 31'.0	343° 39'.1	02'.9	37° 34'.2	58'.0	35° 14'.4	09'.7	277° 04'.5	51'.3
14	145° 33'.5	358° 38'.7	01'.9	52° 34'.8	58'.0	50° 16'.2	09'.6	292° 06'.9	51'.3
15	160° 35'.9	13° 38'.2	00'.9	67° 35'.5	58'.0	65° 18'.1	09'.6	307° 09'.4	51'.3
16	175° 38'.4	28° 37'.7	14° 59'.8 N	82° 36'.1	58'.0	80° 20'.0	09'.6	322° 11'.8	51'.4
17	190° 40'.9	43° 37'.3	58'.8	97° 36'.7	57'.9	95° 21'.8	09'.6	337° 14'.2	51'.4
18	205° 43'.3	58° 36'.8	57'.8	112° 37'.3	57'.9	110° 23'.7	09'.6	352° 16'.6	51'.4
19	220° 45'.8	73° 36'.4	56'.7	127° 37'.9	57'.9	125° 25'.6	09'.6	7° 19'.1	51'.4
20	235° 48'.3	88° 35'.9	55'.7	142° 38'.6	57'.9	140° 27'.4	09'.5	22° 21'.5	51'.5
21	250° 50'.7	103° 35'.4	54'.7	157° 39'.2	57'.9	155° 29'.3	09'.5	37° 23'.9	51'.5
22	265° 53'.2	118° 35'.0	53'.6	172° 39'.8	57'.9	170° 31'.1	09'.5	52° 26'.4	51'.5
23	280° 55'.6	133° 34'.5	52'.6	187° 40'.4	57'.9	185° 33'.0	09'.5	67° 28'.8	51'.5
	M.P. 04:19	v -0'.5	d 1'.0	v 0'.6	d 0'.0	v 1'.9	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.5	40° 14'.8 S
Achernar	335° 26'.8	57° 09'.8 S
Acrux	173° 09'.3	63° 10'.8 S
Adhara	255° 12'.8	28° 59'.5 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.8	55° 53'.4 N
Alkaid	152° 58'.8	49° 15'.0 N
Alnair	27° 43'.3	46° 53'.4 S
Alnilam	275° 46'.6	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.8	26° 40'.4 N
Alpheratz	357° 43'.3	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.6	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.2	69° 03'.1 S
Avior	234° 18'.6	59° 33'.4 S
Bellatrix	278° 32'.2	6° 21'.6 N
Betelgeuse	271° 01'.5	7° 24'.4 N
Canopus	263° 56'.6	52° 42'.2 S
Capella	280° 34'.7	46° 00'.4 N
Deneb	49° 30'.9	45° 19'.9 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.8	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.8 N
Elnath	278° 12'.8	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.5 N
Enif	33° 46'.8	9° 56'.4 N
Fomalhaut	15° 23'.7	29° 32'.7 S
Gacrux	172° 00'.9	57° 11'.6 S
Gienah	175° 52'.3	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.5 S
Hamal	328° 00'.7	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.7	74° 06'.3 N
Markab	13° 38'.0	15° 16'.8 N
Menkar	314° 15'.1	4° 08'.5 N
Menkent	148° 07'.4	36° 26'.3 S
Miaplacidus	221° 40'.4	69° 46'.6 S
Mirfak	308° 40'.4	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.2 S
Polaris	317° 52'.9	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.3	8° 11'.2 S
Rigil Kent	139° 51'.3	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.2	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.5 S
Vega	80° 38'.5	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	214° 57'.0	14:05
Mars	268° 11'.5	10:31
Jupiter	265° 05'.7	10:42
Saturn	146° 34'.6	18:35

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 30'.9	21° 31'.6 N	106° 06'.8	12'.5	6° 10'.5 S	10'.6	56'.8
193° 30'.8	31'.2	120° 38'.3	12'.5	21'.1	10'.7	56'.9
208° 30'.8	30'.8	135° 09'.8	12'.4	31'.8	10'.6	
223° 30'.7	30'.4	149° 41'.2	12'.4	42'.4	10'.6	
238° 30'.6	30'.0	164° 12'.6	12'.3	53'.0	10'.6	57'.0
253° 30'.6	29'.6	178° 43'.9	12'.2	7° 03'.6 S	10'.6	
268° 30'.5	29'.3	193° 15'.1	12'.2	14'.2	10'.5	
283° 30'.5	28'.9	207° 46'.3	12'.1	24'.7	10'.5	57'.1
298° 30'.4	28'.5	222° 17'.4	12'.1	35'.2	10'.5	
313° 30'.3	28'.1	236° 48'.5	12'.0	45'.7	10'.5	
328° 30'.3	27'.7	251° 19'.5	11'.9	56'.2	10'.4	57'.2
343° 30'.2	27'.3	265° 50'.4	11'.9	8° 06'.6 S	10'.4	
358° 30'.1	21° 26'.9 N	280° 21'.3	11'.8	8° 17'.0 S	10'.4	57'.2
13° 30'.1	26'.5	294° 52'.1	11'.8	27'.4	10'.3	57'.3
28° 30'.0	26'.1	309° 22'.9	11'.7	37'.7	10'.3	
43° 30'.0	25'.7	323° 53'.6	11'.6	48'.0	10'.3	
58° 29'.9	25'.2	338° 24'.2	11'.6	58'.3	10'.2	57'.4
73° 29'.8	24'.8	352° 54'.8	11'.4	9° 08'.5 S	10'.2	
88° 29'.8	24'.4	7° 25'.2	11'.5	18'.7	10'.2	
103° 29'.7	24'.0	21° 55'.7	11'.3	28'.9	10'.1	57'.5
118° 29'.7	23'.6	36° 26'.0	11'.3	39'.0	10'.1	
133° 29'.6	23'.2	50° 56'.3	11'.2	49'.1	10'.1	
148° 29'.5	22'.8	65° 26'.5	11'.2	59'.2	10'.0	57'.6
163° 29'.5	22'.4	79° 56'.7	11'.0	10° 09'.2 S	10'.0	
178° 29'.4	21° 22'.0 N	94° 26'.7	11'.0	10° 19'.2 S	9'.9	57'.6
193° 29'.4	21'.6	108° 56'.7	11'.0	29'.1	9'.9	57'.7
208° 29'.3	21'.2	123° 26'.7	10'.8	39'.0	9'.9	
223° 29'.2	20'.8	137° 56'.5	10'.8	48'.9	9'.8	
238° 29'.2	20'.4	152° 26'.3	10'.7	58'.7	9'.7	57'.8
253° 29'.1	20'.0	166° 56'.0	10'.6	11° 08'.4 S	9'.7	
268° 29'.1	19'.5	181° 25'.6	10'.6	18'.1	9'.7	
283° 29'.0	19'.1	195° 55'.2	10'.5	27'.8	9'.6	57'.9
298° 29'.0	18'.7	210° 24'.7	10'.4	37'.4	9'.5	
313° 28'.9	18'.3	224° 54'.1	10'.3	46'.9	9'.5	
328° 28'.8	17'.9	239° 23'.4	10'.2	56'.4	9'.5	58'.0
343° 28'.8	17'.5	253° 52'.6	10'.2	12° 05'.9 S	9'.4	
358° 28'.7	21° 17'.1 N	268° 21'.8	10'.1	12° 15'.3 S	9'.3	58'.0
13° 28'.7	16'.6	282° 50'.9	10'.0	24'.6	9'.3	58'.1
28° 28'.6	16'.2	297° 19'.9	9'.9	33'.9	9'.2	
43° 28'.6	15'.8	311° 48'.8	9'.9	43'.1	9'.2	
58° 28'.5	15'.4	326° 17'.7	9'.7	52'.3	9'.1	58'.2
73° 28'.5	15'.0	340° 46'.4	9'.7	13° 01'.4 S	9'.0	
88° 28'.4	14'.6	355° 15'.1	9'.6	10'.4	9'.0	
103° 28'.3	14'.1	9° 43'.7	9'.5	19'.4	8'.9	58'.3
118° 28'.3	13'.7	24° 12'.2	9'.4	28'.3	8'.9	
133° 28'.2	13'.3	38° 40'.6	9'.4	37'.2	8'.8	58'.4
148° 28'.2	12'.9	53° 09'.0	9'.2	46'.0	8'.7	
163° 28'.1	12'.4	67° 37'.2	9'.2	54'.7	8'.6	
178° 28'.1	21° 12'.0 N	82° 05'.4	9'.1	14° 03'.3 S	8'.6	58'.5
193° 28'.0	11'.6	96° 33'.5	9'.0	11'.9	8'.5	
208° 28'.0	11'.2	111° 01'.5	8'.9	20'.4	8'.5	
223° 27'.9	10'.7	125° 29'.4	8'.9	28'.9	8'.3	58'.6
238° 27'.9	10'.3	139° 57'.3	8'.7	37'.2	8'.3	
253° 27'.8	09'.9	154° 25'.0	8'.7	45'.5	8'.2	
268° 27'.8	09'.5	168° 52'.7	8'.6	53'.7	8'.1	58'.7
283° 27'.7	09'.0	183° 20'.3	8'.4	15° 01'.8 S	8'.1	
298° 27'.7	08'.6	197° 47'.7	8'.4	09'.9	8'.0	
313° 27'.6	08'.2	212° 15'.1	8'.4	17'.9	7'.9	58'.8
328° 27'.6	07'.8	226° 42'.5	8'.2	25'.8	7'.8	
343° 27'.5	07'.3	241° 09'.7	8'.1	33'.6	7'.7	
358° 27'.4	21° 06'.9 N	255° 36'.8	8'.1	15° 41'.3 S	7'.6	58'.9
13° 27'.4	06'.5	270° 03'.9	7'.9	48'.9	7'.6	
28° 27'.3	06'.0	284° 30'.8	7'.9	56'.5	7'.4	
43° 27'.3	05'.6	298° 57'.7	7'.8	16° 03'.9 S	7'.4	59'.0
58° 27'.3	05'.2	313° 24'.5	7'.7	11'.3	7'.3	
73° 27'.2	04'.7	327° 51'.2	7'.6	18'.6	7'.2	
88° 27'.2	04'.3	342° 17'.8	7'.5	25'.8	7'.1	59'.1
103° 27'.1	03'.9	356° 44'.3	7'.5	32'.9	7'.0	
118° 27'.1	03'.4	11° 10'.8	7'.3	39'.9	6'.9	59'.2
133° 27'.0	03'.0	25° 37'.1	7'.3	46'.8	6'.8	
148° 27'.0	02'.6	40° 03'.4	7'.2	53'.6	6'.7	
163° 26'.9	02'.1	54° 29'.6	7'.0	17° 00'.3 S	6'.7	59'.3
SD 15'.7	d 0'.4	SD 15'.6		15'.8	16'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 15	Moonrise 16	Moonrise 17
N 72°	-	-	-	13:12	15:12	17:34
N 70°	-	-	-	12:59	14:47	16:44
68°	-	-	-	12:48	14:28	16:13
66°	-	-	01:40	12:39	14:13	15:51
64°	-	-	02:19	12:31	14:01	15:33
62°	-	00:58	02:45	12:25	13:51	15:18
60°	-	01:49	03:06	12:19	13:42	15:06
N 58°	-	02:19	03:22	12:14	13:34	14:55
56°	00:53	02:41	03:37	12:10	13:27	14:46
54°	01:40	02:59	03:49	12:06	13:21	14:38
52°	02:07	03:14	03:59	12:03	13:16	14:30
50°	02:28	03:27	04:09	11:59	13:11	14:24
45°	03:06	03:53	04:29	11:52	13:00	14:10
N 40°	03:33	04:13	04:45	11:47	12:52	13:58
35°	03:54	04:29	04:58	11:42	12:44	13:48
30°	04:10	04:43	05:10	11:38	12:38	13:40
20°	04:37	05:05	05:30	11:30	12:26	13:25
N 10°	04:57	05:24	05:47	11:24	12:16	13:12
0°	05:14	05:40	06:02	11:18	12:07	13:00
S 10°	05:30	05:56	06:18	11:12	11:58	12:49
20°	05:44	06:11	06:35	11:05	11:49	12:36
30°	05:59	06:28	06:54	10:58	11:38	12:22
35°	06:06	06:37	07:05	10:54	11:31	12:13
40°	06:14	06:48	07:18	10:50	11:24	12:04
45°	06:23	07:00	07:32	10:44	11:16	11:53
S 50°	06:33	07:14	07:51	10:38	11:06	11:40
52°	06:38	07:20	07:59	10:35	11:02	11:34
54°	06:42	07:27	08:09	10:32	10:57	11:27
56°	06:47	07:35	08:20	10:28	10:51	11:19
58°	06:53	07:44	08:32	10:24	10:45	11:11
S 60°	06:59	07:53	08:47	10:20	10:38	11:01
S 62°	07:06	08:05	09:04	10:15	10:30	10:50

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 15	Moonset 16	Moonset 17
N 72°	-	-	-	21:25	21:09	20:40
N 70°	-	-	-	21:41	21:36	21:30
68°	-	-	-	21:53	21:56	22:02
66°	22:28	-	-	22:04	22:12	22:26
64°	21:51	-	-	22:12	22:26	22:45
62°	21:25	23:08	-	22:20	22:37	23:00
60°	21:05	22:21	-	22:26	22:46	23:13
N 58°	20:49	21:52	-	22:32	22:55	23:24
56°	20:35	21:30	23:14	22:37	23:02	23:34
54°	20:23	21:12	22:30	22:42	23:09	23:42
52°	20:12	20:57	22:03	22:46	23:15	23:50
50°	20:03	20:44	21:42	22:50	23:20	23:57
45°	19:43	20:19	21:05	22:58	23:32	24:12
N 40°	19:27	19:59	20:39	23:05	23:42	24:24
35°	19:14	19:43	20:18	23:11	23:50	24:35
30°	19:02	19:29	20:01	23:16	23:58	24:44
20°	18:42	19:07	19:35	23:25	-	00:10
N 10°	18:25	18:48	19:15	23:33	-	00:22
0°	18:10	18:32	18:58	23:41	-	00:32
S 10°	17:54	18:17	18:42	23:49	-	00:43
20°	17:37	18:01	18:28	23:57	-	00:54
30°	17:18	17:44	18:14	-	00:06	01:07
35°	17:07	17:35	18:06	-	00:11	01:14
40°	16:55	17:25	17:58	-	00:17	01:23
45°	16:40	17:13	17:49	-	00:25	01:33
S 50°	16:22	16:59	17:39	-	00:33	01:45
52°	16:13	16:53	17:35	-	00:37	01:51
54°	16:04	16:46	17:30	-	00:41	01:57
56°	15:53	16:38	17:25	-	00:46	02:04
58°	15:41	16:29	17:20	-	00:52	02:12
S 60°	15:26	16:19	17:14	-	00:58	02:21
S 62°	15:09	16:08	17:07	-	01:05	02:31

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
15	5 56	5 59	12:06	17:29	05:05	7d 43%
16	6 02	6 05	12:06	18:20	05:54	8d 54%
17	6 08	6 10	12:06	19:14	06:46	9d 65%

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2013 July 18, 19, 20 (Thur, Fri, Sat)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
18 Thursday 00	295° 58'.1	148° 34'.0	14° 51'.6 N	202° 41'.0	23° 57'.9 N	200° 34'.9	23° 09'.5 N	82° 31'.2	10° 51'.6 S
01	311° 00'.6	163° 33'.6	50'.5	217° 41'.7	57'.9	215° 36'.7	09'.5	97° 33'.7	51'.6
02	326° 03'.0	178° 33'.1	49'.5	232° 42'.3	57'.8	230° 38'.6	09'.4	112° 36'.1	51'.6
03	341° 05'.5	193° 32'.7	48'.5	247° 42'.9	57'.8	245° 40'.5	09'.4	127° 38'.5	51'.6
04	356° 08'.0	208° 32'.2	47'.4	262° 43'.5	57'.8	260° 42'.3	09'.4	142° 40'.9	51'.7
05	11° 10'.4	223° 31'.7	46'.4	277° 44'.2	57'.8	275° 44'.2	09'.4	157° 43'.4	51'.7
06	26° 12'.9	238° 31'.3	45'.4	292° 44'.8	57'.8	290° 46'.0	09'.4	172° 45'.8	51'.7
07	41° 15'.4	253° 30'.8	44'.3	307° 45'.4	57'.8	305° 47'.9	09'.4	187° 48'.2	51'.7
08	56° 17'.8	268° 30'.4	43'.3	322° 46'.0	57'.7	320° 49'.8	09'.3	202° 50'.7	51'.8
09	71° 20'.3	283° 29'.9	42'.2	337° 46'.6	57'.7	335° 51'.6	09'.3	217° 53'.1	51'.8
10	86° 22'.8	298° 29'.4	41'.2	352° 47'.3	57'.7	350° 53'.5	09'.3	232° 55'.5	51'.8
11	101° 25'.2	313° 29'.0	40'.2	7° 47'.9	57'.7	5° 55'.4	09'.3	247° 57'.9	51'.8
12	116° 27'.7	328° 28'.5	14° 39'.1 N	22° 48'.5	23° 57'.7 N	20° 57'.2	23° 09'.3 N	263° 00'.4	10° 51'.9 S
13	131° 30'.1	343° 28'.1	38'.1	37° 49'.1	57'.7	35° 59'.1	09'.2	278° 02'.8	51'.9
14	146° 32'.6	358° 27'.6	37'.0	52° 49'.7	57'.6	51° 01'.0	09'.2	293° 05'.2	51'.9
15	161° 35'.1	13° 27'.2	36'.0	67° 50'.4	57'.6	66° 02'.8	09'.2	308° 07'.6	51'.9
16	176° 37'.5	28° 26'.7	34'.9	82° 51'.0	57'.6	81° 04'.7	09'.2	323° 10'.1	52'.0
17	191° 40'.0	43° 26'.3	33'.9	97° 51'.6	57'.6	96° 06'.6	09'.2	338° 12'.5	52'.0
18	206° 42'.5	58° 25'.8	32'.8	112° 52'.2	57'.6	111° 08'.4	09'.2	353° 14'.9	52'.0
19	221° 44'.9	73° 25'.4	31'.8	127° 52'.9	57'.5	126° 10'.3	09'.1	8° 17'.4	52'.0
20	236° 47'.4	88° 24'.9	30'.8	142° 53'.5	57'.5	141° 12'.1	09'.1	23° 19'.8	52'.1
21	251° 49'.9	103° 24'.5	29'.7	157° 54'.1	57'.5	156° 14'.0	09'.1	38° 22'.2	52'.1
22	266° 52'.3	118° 24'.0	28'.7	172° 54'.7	57'.5	171° 15'.9	09'.1	53° 24'.6	52'.1
23	281° 54'.8	133° 23'.6	27'.6	187° 55'.4	57'.5	186° 17'.7	09'.1	68° 27'.1	52'.1
19 Friday 00	296° 57'.3	148° 23'.1	14° 26'.6 N	202° 56'.0	23° 57'.4 N	201° 19'.6	23° 09'.1 N	83° 29'.5	10° 52'.2 S
01	311° 59'.7	163° 22'.7	25'.5	217° 56'.6	57'.4	216° 21'.5	09'.0	98° 31'.9	52'.2
02	327° 02'.2	178° 22'.2	24'.5	232° 57'.2	57'.4	231° 23'.3	09'.0	113° 34'.3	52'.2
03	342° 04'.6	193° 21'.8	23'.4	247° 57'.9	57'.4	246° 25'.2	09'.0	128° 36'.8	52'.2
04	357° 07'.1	208° 21'.3	22'.4	262° 58'.5	57'.4	261° 27'.1	09'.0	143° 39'.2	52'.3
05	12° 09'.6	223° 20'.9	21'.3	277° 59'.1	57'.3	276° 28'.9	09'.0	158° 41'.6	52'.3
06	27° 12'.0	238° 20'.4	20'.2	292° 59'.7	57'.3	291° 30'.8	08'.9	173° 44'.0	52'.3
07	42° 14'.5	253° 20'.0	19'.2	308° 00'.3	57'.3	306° 32'.7	08'.9	188° 46'.5	52'.3
08	57° 17'.0	268° 19'.5	18'.1	323° 01'.0	57'.3	321° 34'.5	08'.9	203° 48'.9	52'.4
09	72° 19'.4	283° 19'.1	17'.1	338° 01'.6	57'.2	336° 36'.4	08'.9	218° 51'.3	52'.4
10	87° 21'.9	298° 18'.6	16'.0	353° 02'.2	57'.2	351° 38'.3	08'.9	233° 53'.7	52'.4
11	102° 24'.4	313° 18'.2	15'.0	8° 02'.8	57'.2	6° 40'.1	08'.9	248° 56'.2	52'.4
12	117° 26'.8	328° 17'.8	14° 13'.9 N	23° 03'.5	23° 57'.2 N	21° 42'.0	23° 08'.8 N	263° 58'.6	10° 52'.5 S
13	132° 29'.3	343° 17'.3	12'.9	38° 04'.1	57'.1	36° 43'.9	08'.8	279° 01'.0	52'.5
14	147° 31'.8	358° 16'.9	11'.8	53° 04'.7	57'.1	51° 45'.7	08'.8	294° 03'.4	52'.5
15	162° 34'.2	13° 16'.4	10'.7	68° 05'.3	57'.1	66° 47'.6	08'.8	309° 05'.8	52'.5
16	177° 36'.7	28° 16'.0	09'.7	83° 06'.0	57'.1	81° 49'.5	08'.8	324° 08'.3	52'.6
17	192° 39'.1	43° 15'.6	08'.6	98° 06'.6	57'.0	96° 51'.3	08'.7	339° 10'.7	52'.6
18	207° 41'.6	58° 15'.1	07'.6	113° 07'.2	57'.0	111° 53'.2	08'.7	354° 13'.1	52'.6
19	222° 44'.1	73° 14'.7	06'.5	128° 07'.9	57'.0	126° 55'.1	08'.7	9° 15'.5	52'.6
20	237° 46'.5	88° 14'.2	05'.4	143° 08'.5	56'.9	141° 56'.9	08'.7	24° 18'.0	52'.7
21	252° 49'.0	103° 13'.8	04'.4	158° 09'.1	56'.9	156° 58'.8	08'.7	39° 20'.4	52'.7
22	267° 51'.5	118° 13'.4	03'.3	173° 09'.7	56'.9	172° 00'.7	08'.7	54° 22'.8	52'.7
23	282° 53'.9	133° 12'.9	02'.2	188° 10'.4	56'.8	187° 02'.5	08'.6	69° 25'.2	52'.7
20 Saturday 00	297° 56'.4	148° 12'.5	14° 01'.2 N	203° 11'.0	23° 56'.8 N	202° 04'.4	23° 08'.6 N	84° 27'.6	10° 52'.8 S
01	312° 58'.9	163° 12'.1	00'.1	218° 11'.6	56'.8	217° 06'.3	08'.6	99° 30'.1	52'.8
02	328° 01'.3	178° 11'.6	13° 59'.0 N	233° 12'.2	56'.8	232° 08'.1	08'.6	114° 32'.5	52'.8
03	343° 03'.8	193° 11'.2	58'.0	248° 12'.9	56'.7	247° 10'.0	08'.6	129° 34'.9	52'.9
04	358° 06'.3	208° 10'.7	56'.9	263° 13'.5	56'.7	262° 11'.9	08'.5	144° 37'.3	52'.9
05	13° 08'.7	223° 10'.3	55'.8	278° 14'.1	56'.7	277° 13'.7	08'.5	159° 39'.8	52'.9
06	28° 11'.2	238° 09'.9	54'.8	293° 14'.7	56'.6	292° 15'.6	08'.5	174° 42'.2	52'.9
07	43° 13'.6	253° 09'.4	53'.7	308° 15'.4	56'.6	307° 17'.5	08'.5	189° 44'.6	53'.0
08	58° 16'.1	268° 09'.0	52'.6	323° 16'.0	56'.6	322° 19'.3	08'.5	204° 47'.0	53'.0
09	73° 18'.6	283° 08'.6	51'.6	338° 16'.6	56'.5	337° 21'.2	08'.4	219° 49'.4	53'.0
10	88° 21'.0	298° 08'.2	50'.5	353° 17'.2	56'.5	352° 23'.1	08'.4	234° 51'.9	53'.0
11	103° 23'.5	313° 07'.7	49'.4	8° 17'.9	56'.5	7° 24'.9	08'.4	249° 54'.3	53'.1
12	118° 26'.0	328° 07'.3	13° 48'.4 N	23° 18'.5	23° 56'.4 N	22° 26'.8	23° 08'.4 N	264° 56'.7	10° 53'.1 S
13	133° 28'.4	343° 06'.9	47'.3	38° 19'.1	56'.4	37° 28'.7	08'.4	279° 59'.1	53'.1
14	148° 30'.9	358° 06'.4	46'.2	53° 19'.8	56'.4	52° 30'.5	08'.4	295° 01'.5	53'.2
15	163° 33'.4	13° 06'.0	45'.1	68° 20'.4	56'.3	67° 32'.4	08'.3	310° 04'.0	53'.2
16	178° 35'.8	28° 05'.6	44'.1	83° 21'.0	56'.3	82° 34'.3	08'.3	325° 06'.4	53'.2
17	193° 38'.3	43° 05'.2	43'.0	98° 21'.6	56'.3	97° 36'.1	08'.3	340° 08'.8	53'.2
18	208° 40'.7	58° 04'.7	41'.9	113° 22'.3	56'.2	112° 38'.0	08'.3	355° 11'.2	53'.3
19	223° 43'.2	73° 04'.3	40'.8	128° 22'.9	56'.2	127° 39'.9	08'.3	10° 13'.6	53'.3
20	238° 45'.7	88° 03'.9	39'.8	143° 23'.5	56'.1	142° 41'.7	08'.2	25° 16'.0	53'.3
21	253° 48'.1	103° 03'.4	38'.7	158° 24'.2	56'.1	157° 43'.6	08'.2	40° 18'.5	53'.3
22	268° 50'.6	118° 03'.0	37'.6	173° 24'.8	56'.1	172° 45'.5	08'.2	55° 20'.9	53'.4
23	283° 53'.1	133° 02'.6	36'.5	188° 25'.4	56'.0	187° 47'.3	08'.2	70° 23'.3	53'.4
	M.P. 04:08	v -0'.4	d 1'.1	v 0'.6	d 0'.0	v 1'.9	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.4	40° 14'.8 S
Achernar	335° 26'.8	57° 09'.8 S
Acrux	173° 09'.4	63° 10'.8 S
Adhara	255° 12'.8	28° 59'.5 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.8	55° 53'.4 N
Alkaid	152° 58'.9	49° 15'.0 N
Alnair	27° 43'.3	46° 53'.4 S
Alnilam	275° 46'.6	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.8	26° 40'.4 N
Alpheratz	357° 43'.2	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.5	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.2	69° 03'.1 S
Avior	234° 18'.6	59° 33'.4 S
Bellatrix	278° 32'.2	6° 21'.6 N
Betelgeuse	271° 01'.5	7° 24'.4 N
Canopus	263° 56'.6	52° 42'.2 S
Capella	280° 34'.7	46° 00'.4 N
Deneb	49° 30'.9	45° 19'.9 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.7	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.8 N
Elnath	278° 12'.8	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.5 N
Enif	33° 46'.7	9° 56'.4 N
Fomalhaut	15° 23'.7	29° 32'.7 S
Gacrux	172° 00'.9	57° 11'.6 S
Gienah	175° 52'.3	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.5 S
Hamal	328° 00'.7	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.8	74° 06'.3 N
Markab	13° 38'.0	15° 16'.8 N
Menkar	314° 15'.1	4° 08'.5 N
Menkent	148° 07'.4	36° 26'.3 S
Miaplacidus	221° 40'.4	69° 46'.6 S
Mirfak	308° 40'.4	49° 54'.3 N
Nunki	75° 57'.8	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.2 S
Polaris	317° 51'.3	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.2	8° 11'.2 S
Rigil Kent	139° 51'.3	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.2	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.4 S
Vega	80° 38'.5	38° 48'.1 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	211° 25'.9	14:07
Mars	265° 58'.7	10:28
Jupiter	264° 22'.4	10:33
Saturn	146° 32'.2	18:23

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 26'.9	21° 01'.7 N	68° 55'.6	7'.0	17° 07'.0 S	6'.5	59'.3
193° 26'.8	01'.2	83° 21'.6	7'.0	13'.5	6'.4	
208° 26'.8	00'.8	97° 47'.6	6'.8	19'.9	6'.3	59'.4
223° 26'.7	00'.4	112° 13'.4	6'.7	26'.2	6'.2	
238° 26'.7	20° 59'.9 N	126° 39'.1	6'.7	32'.4	6'.1	
253° 26'.6	59'.5	141° 04'.8	6'.6	38'.5	6'.0	59'.5
268° 26'.6	59'.0	155° 30'.4	6'.5	44'.5	5'.9	
283° 26'.5	58'.6	169° 55'.9	6'.4	50'.4	5'.8	
298° 26'.5	58'.2	184° 21'.3	6'.3	56'.2	5'.6	59'.6
313° 26'.4	57'.7	198° 46'.6	6'.3	18° 01'.8 S	5'.6	
328° 26'.4	57'.3	213° 11'.9	6'.1	07'.4	5'.4	
343° 26'.4	56'.8	227° 37'.0	6'.1	12'.8	5'.4	59'.7
358° 26'.3	20° 56'.4 N	242° 02'.1	6'.0	18° 18'.2 S	5'.2	59'.7
13° 26'.3	55'.9	256° 27'.1	5'.9	23'.4	5'.1	
28° 26'.2	55'.5	270° 52'.0	5'.9	28'.5	5'.0	
43° 26'.2	55'.0	285° 16'.9	5'.7	33'.5	4'.8	59'.8
58° 26'.1	54'.6	299° 41'.6	5'.7	38'.3	4'.8	
73° 26'.1	54'.1	314° 06'.3	5'.6	43'.1	4'.6	
88° 26'.0	53'.7	328° 30'.9	5'.6	47'.7	4'.5	59'.9
103° 26'.0	53'.2	342° 55'.5	5'.4	52'.2	4'.4	
118° 26'.0	52'.8	357° 19'.9	5'.4	56'.6	4'.2	
133° 25'.9	52'.3	11° 44'.3	5'.3	19° 00'.8 S	4'.1	60'.0
148° 25'.9	51'.9	26° 08'.6	5'.3	04'.9	4'.0	
163° 25'.8	51'.4	40° 32'.9	5'.1	08'.9	3'.9	
178° 25'.8	20° 51'.0 N	54° 57'.0	5'.1	19° 12'.8 S	3'.7	60'.1
193° 25'.8	50'.5	69° 21'.1	5'.1	16'.5	3'.7	
208° 25'.7	50'.1	83° 45'.2	4'.9	20'.2	3'.4	
223° 25'.7	49'.6	98° 09'.1	4'.9	23'.6	3'.4	
238° 25'.6	49'.2	112° 33'.0	4'.9	27'.0	3'.2	60'.2
253° 25'.6	48'.7	126° 56'.9	4'.8	30'.2	3'.1	
268° 25'.5	48'.3	141° 20'.7	4'.7	33'.3	2'.9	
283° 25'.5	47'.8	155° 44'.4	4'.6	36'.2	2'.9	60'.3
298° 25'.5	47'.3	170° 08'.0	4'.6	39'.1	2'.6	
313° 25'.4	46'.9	184° 31'.6	4'.5	41'.7	2'.6	
328° 25'.4	46'.4	198° 55'.1	4'.5	44'.3	2'.4	
343° 25'.4	46'.0	213° 18'.6	4'.4	46'.7	2'.2	60'.4
358° 25'.3	20° 45'.5 N	227° 42'.0	4'.4	19° 48'.9 S	2'.2	60'.4
13° 25'.3	45'.0	242° 05'.4	4'.3	51'.1	2'.0	
28° 25'.2	44'.6	256° 28'.7	4'.2	53'.1	1'.8	
43° 25'.2	44'.1	270° 51'.9	4'.2	54'.9	1'.7	60'.5
58° 25'.2	43'.7	285° 15'.1	4'.2	56'.6	1'.6	
73° 25'.1	43'.2	299° 38'.3	4'.1	58'.2	1'.4	
88° 25'.1	42'.7	314° 01'.4	4'.1	59'.6	1'.3	
103° 25'.0	42'.3	328° 24'.5	4'.0	20° 00'.9 S	1'.1	60'.6
118° 25'.0	41'.8	342° 47'.5	4'.0	02'.0	1'.0	
133° 25'.0	41'.3	357° 10'.5	3'.9	03'.0	0'.8	
148° 24'.9	40'.9	11° 33'.4	3'.9	03'.8	0'.7	
163° 24'.9	40'.4	25° 56'.3	3'.9	04'.5	0'.6	60'.7
178° 24'.9	20° 39'.9 N	40° 19'.2	3'.8	20° 05'.1 S	0'.4	60'.7
193° 24'.8	39'.5	54° 42'.0	3'.8	05'.5	0'.2	
208° 24'.8	39'.0	69° 04'.8	3'.8	05'.7	0'.1	
223° 24'.8	38'.5	83° 27'.6	3'.7	05'.8	0'.0	
238° 24'.7	38'.1	97° 50'.3	3'.7	05'.8	0'.2	60'.8
253° 24'.7	37'.6	112° 13'.0	3'.7	05'.6	0'.3	
268° 24'.7	37'.1	126° 35'.7	3'.7	05'.3	0'.5	
283° 24'.6	36'.7	140° 58'.4	3'.6	04'.8	0'.6	
298° 24'.6	36'.2	155° 21'.0	3'.6	04'.2	0'.8	
313° 24'.6	35'.7	169° 43'.6	3'.6	03'.4	0'.9	60'.9
328° 24'.5	35'.2	184° 06'.2	3'.6	02'.5	1'.1	
343° 24'.5	34'.8	198° 28'.8	3'.6	01'.4	1'.2	
358° 24'.5	20° 34'.3 N	212° 51'.4	3'.5	20° 00'.2 S	1'.4	60'.9
13° 24'.4	33'.8	227° 13'.9	3'.6	19° 58'.8 S	1'.5	
28° 24'.4	33'.3	241° 36'.5	3'.5	57'.3	1'.7	
43° 24'.4	32'.9	255° 59'.0	3'.5	55'.6	1'.8	61'.0
58° 24'.3	32'.4	270° 21'.5	3'.6	53'.8	2'.0	
73° 24'.3	31'.9	284° 44'.1	3'.5	51'.8	2'.1	
88° 24'.3	31'.4	299° 06'.6	3'.5	49'.7	2'.3	
103° 24'.2	31'.0	313° 29'.1	3'.5	47'.4	2'.4	
118° 24'.2	30'.5	327° 51'.6	3'.5	45'.0	2'.6	
133° 24'.2	30'.0	342° 14'.1	3'.5	42'.4	2'.7	
148° 24'.1	29'.5	356° 36'.6	3'.6	39'.7	2'.9	
163° 24'.1	29'.0	10° 59'.2	3'.5	36'.8	3'.0	61'.1
SD 15'.7	d 0'.5	SD 16'.3		16'.5	16'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20
N 72°	-	-	-	-	-	-
N 70°	-	-	-	18:53	-	21:43
68°	-	-	00:47	17:59	19:30	20:24
66°	-	-	01:53	17:26	18:48	19:46
64°	-	-	02:28	17:02	18:20	19:19
62°	-	01:16	02:52	16:43	17:59	18:58
60°	-	01:58	03:12	16:27	17:41	18:42
N 58°	-	02:26	03:28	16:14	17:27	18:27
56°	01:09	02:47	03:41	16:03	17:14	18:15
54°	01:48	03:04	03:53	15:53	17:03	18:04
52°	02:14	03:18	04:03	15:44	16:53	17:55
50°	02:34	03:31	04:12	15:36	16:45	17:46
45°	03:10	03:56	04:31	15:19	16:26	17:28
N 40°	03:36	04:15	04:47	15:05	16:11	17:13
35°	03:56	04:31	05:00	14:54	15:59	17:01
30°	04:12	04:45	05:11	14:44	15:48	16:50
20°	04:38	05:07	05:31	14:26	15:29	16:31
N 10°	04:58	05:25	05:47	14:11	15:12	16:15
0°	05:15	05:41	06:03	13:57	14:57	15:59
S 10°	05:30	05:56	06:18	13:43	14:42	15:44
20°	05:44	06:11	06:34	13:28	14:26	15:28
30°	05:58	06:27	06:53	13:11	14:07	15:09
35°	06:05	06:36	07:03	13:01	13:56	14:58
40°	06:13	06:46	07:16	12:50	13:44	14:46
45°	06:21	06:58	07:30	12:37	13:29	14:31
S 50°	06:31	07:11	07:48	12:21	13:11	14:13
52°	06:35	07:17	07:56	12:13	13:03	14:04
54°	06:40	07:24	08:05	12:05	12:54	13:55
56°	06:44	07:31	08:16	11:56	12:43	13:44
58°	06:50	07:40	08:28	11:45	12:31	13:32
S 60°	06:56	07:49	08:41	11:33	12:17	13:18
S 62°	07:02	08:00	08:58	11:19	12:01	13:01

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 18	Moonset 19	Moonset 20
N 72°	-	-	-	-	-	-
N 70°	-	-	-	21:22	-	22:50
68°	23:15	-	-	22:17	22:52	24:09
66°	22:16	-	-	22:50	23:34	24:46
64°	21:43	-	-	23:14	-	00:02
62°	21:18	22:52	-	23:34	-	00:24
60°	20:59	22:12	-	23:50	-	00:41
N 58°	20:44	21:45	-	-	00:03	00:56
56°	20:30	21:24	22:59	-	00:15	01:09
54°	20:19	21:07	22:22	-	00:25	01:20
52°	20:09	20:53	21:57	-	00:34	01:29
50°	20:00	20:41	21:37	-	00:42	01:38
45°	19:41	20:16	21:01	00:12	01:00	01:57
N 40°	19:25	19:57	20:36	00:24	01:14	02:12
35°	19:12	19:41	20:16	00:35	01:26	02:24
30°	19:01	19:28	20:00	00:44	01:37	02:36
20°	18:42	19:06	19:34	01:00	01:55	02:55
N 10°	18:25	18:48	19:14	01:14	02:11	03:11
0°	18:10	18:32	18:58	01:27	02:25	03:27
S 10°	17:55	18:17	18:43	01:40	02:40	03:42
20°	17:39	18:02	18:29	01:54	02:56	03:58
30°	17:20	17:46	18:15	02:10	03:14	04:17
35°	17:09	17:37	18:08	02:19	03:25	04:28
40°	16:57	17:27	18:00	02:30	03:37	04:41
45°	16:43	17:15	17:52	02:43	03:51	04:56
S 50°	16:25	17:02	17:42	02:58	04:09	05:14
52°	16:17	16:56	17:38	03:05	04:17	05:22
54°	16:08	16:49	17:34	03:13	04:26	05:32
56°	15:57	16:42	17:29	03:22	04:36	05:43
58°	15:46	16:33	17:23	03:32	04:48	05:55
S 60°	15:32	16:24	17:18	03:44	05:02	06:09
S 62°	15:15	16:13	17:11	03:57	05:18	06:26

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
18	6 12	6 15	12:06	20:11	07:42	10d 75%
19	6 17	6 19	12:06	21:12	08:41	11d 85%
20	6 20	6 22	12:06	22:14	09:43	12d 92%

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2013 July 21, 22, 23 (Sun, Mon, Tue)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
21 Sunday									
00	298° 55'.5	148° 02'.2	13° 35'.4 N	203° 26'.0	23° 56'.0 N	202° 49'.2	23° 08'.2 N	85° 25'.7	10° 53'.4 S
01	313° 58'.0	163° 01'.8	34'.4	218° 26'.7	55'.9	217° 51'.1	08'.1	100° 28'.1	53'.5
02	329° 00'.5	178° 01'.3	33'.3	233° 27'.3	55'.9	232° 52'.9	08'.1	115° 30'.6	53'.5
03	344° 02'.9	193° 00'.9	32'.2	248° 27'.9	55'.9	247° 54'.8	08'.1	130° 33'.0	53'.5
04	359° 05'.4	208° 00'.5	31'.1	263° 28'.6	55'.8	262° 56'.7	08'.1	145° 35'.4	53'.5
05	14° 07'.9	223° 00'.1	30'.0	278° 29'.2	55'.8	277° 58'.6	08'.1	160° 37'.8	53'.6
06	29° 10'.3	237° 59'.6	29'.0	293° 29'.8	55'.7	293° 00'.4	08'.0	175° 40'.2	53'.6
07	44° 12'.8	252° 59'.2	27'.9	308° 30'.4	55'.7	308° 02'.3	08'.0	190° 42'.6	53'.6
08	59° 15'.2	267° 58'.8	26'.8	323° 31'.1	55'.7	323° 04'.2	08'.0	205° 45'.1	53'.7
09	74° 17'.7	282° 58'.4	25'.7	338° 31'.7	55'.6	338° 06'.0	08'.0	220° 47'.5	53'.7
10	89° 20'.2	297° 58'.0	24'.6	353° 32'.3	55'.6	353° 07'.9	08'.0	235° 49'.9	53'.7
11	104° 22'.6	312° 57'.5	23'.5	8° 33'.0	55'.5	8° 09'.8	07'.9	250° 52'.3	53'.7
12	119° 25'.1	327° 57'.1	13° 22'.4 N	23° 33'.6	23° 55'.5 N	23° 11'.6	23° 07'.9 N	265° 54'.7	10° 53'.8 S
13	134° 27'.6	342° 56'.7	21'.4	38° 34'.2	55'.5	38° 13'.5	07'.9	280° 57'.1	53'.8
14	149° 30'.0	357° 56'.3	20'.3	53° 34'.9	55'.4	53° 15'.4	07'.9	295° 59'.6	53'.8
15	164° 32'.5	12° 55'.9	19'.2	68° 35'.5	55'.4	68° 17'.2	07'.9	311° 02'.0	53'.9
16	179° 35'.0	27° 55'.5	18'.1	83° 36'.1	55'.3	83° 19'.1	07'.8	326° 04'.4	53'.9
17	194° 37'.4	42° 55'.1	17'.0	98° 36'.7	55'.3	98° 21'.0	07'.8	341° 06'.8	53'.9
18	209° 39'.9	57° 54'.6	15'.9	113° 37'.4	55'.2	113° 22'.9	07'.8	356° 09'.2	53'.9
19	224° 42'.4	72° 54'.2	14'.8	128° 38'.0	55'.2	128° 24'.7	07'.8	11° 11'.6	54'.0
20	239° 44'.8	87° 53'.8	13'.7	143° 38'.6	55'.1	143° 26'.6	07'.8	26° 14'.0	54'.0
21	254° 47'.3	102° 53'.4	12'.6	158° 39'.3	55'.1	158° 28'.5	07'.7	41° 16'.5	54'.0
22	269° 49'.7	117° 53'.0	11'.6	173° 39'.9	55'.0	173° 30'.3	07'.7	56° 18'.9	54'.1
23	284° 52'.2	132° 52'.6	10'.5	188° 40'.5	55'.0	188° 32'.2	07'.7	71° 21'.3	54'.1
22 Monday									
00	299° 54'.7	147° 52'.2	13° 09'.4 N	203° 41'.2	23° 55'.0 N	203° 34'.1	23° 07'.7 N	86° 23'.7	10° 54'.1 S
01	314° 57'.1	162° 51'.8	08'.3	218° 41'.8	54'.9	218° 35'.9	07'.7	101° 26'.1	54'.1
02	329° 59'.6	177° 51'.3	07'.2	233° 42'.4	54'.9	233° 37'.8	07'.6	116° 28'.5	54'.2
03	345° 02'.1	192° 50'.9	06'.1	248° 43'.1	54'.8	248° 39'.7	07'.6	131° 30'.9	54'.2
04	0° 04'.5	207° 50'.5	05'.0	263° 43'.7	54'.8	263° 41'.6	07'.6	146° 33'.4	54'.2
05	15° 07'.0	222° 50'.1	03'.9	278° 44'.3	54'.7	278° 43'.4	07'.6	161° 35'.8	54'.3
06	30° 09'.5	237° 49'.7	02'.8	293° 45'.0	54'.7	293° 45'.3	07'.6	176° 38'.2	54'.3
07	45° 11'.9	252° 49'.3	01'.7	308° 45'.6	54'.6	308° 47'.2	07'.5	191° 40'.6	54'.3
08	60° 14'.4	267° 48'.9	00'.6	323° 46'.2	54'.6	323° 49'.0	07'.5	206° 43'.0	54'.3
09	75° 16'.9	282° 48'.5	12° 59'.5 N	338° 46'.9	54'.5	338° 50'.9	07'.5	221° 45'.4	54'.4
10	90° 19'.3	297° 48'.1	58'.4	353° 47'.5	54'.5	353° 52'.8	07'.5	236° 47'.8	54'.4
11	105° 21'.8	312° 47'.7	57'.3	8° 48'.1	54'.4	8° 54'.6	07'.5	251° 50'.2	54'.4
12	120° 24'.2	327° 47'.3	12° 56'.2 N	23° 48'.8	23° 54'.4 N	23° 56'.5	23° 07'.4 N	266° 52'.7	10° 54'.5 S
13	135° 26'.7	342° 46'.9	55'.1	38° 49'.4	54'.3	38° 58'.4	07'.4	281° 55'.1	54'.5
14	150° 29'.2	357° 46'.5	54'.0	53° 50'.0	54'.3	54° 00'.3	07'.4	296° 57'.5	54'.5
15	165° 31'.6	12° 46'.1	52'.9	68° 50'.7	54'.2	69° 02'.1	07'.4	311° 59'.9	54'.6
16	180° 34'.1	27° 45'.7	51'.8	83° 51'.3	54'.2	84° 04'.0	07'.3	327° 02'.3	54'.6
17	195° 36'.6	42° 45'.3	50'.7	98° 51'.9	54'.1	99° 05'.9	07'.3	342° 04'.7	54'.6
18	210° 39'.0	57° 44'.8	49'.6	113° 52'.6	54'.0	114° 07'.7	07'.3	357° 07'.1	54'.6
19	225° 41'.5	72° 44'.4	48'.5	128° 53'.2	54'.0	129° 09'.6	07'.3	12° 09'.5	54'.7
20	240° 44'.0	87° 44'.0	47'.4	143° 53'.8	53'.9	144° 11'.5	07'.3	27° 11'.9	54'.7
21	255° 46'.4	102° 43'.6	46'.3	158° 54'.5	53'.9	159° 13'.4	07'.2	42° 14'.4	54'.7
22	270° 48'.9	117° 43'.2	45'.2	173° 55'.1	53'.8	174° 15'.2	07'.2	57° 16'.8	54'.8
23	285° 51'.4	132° 42'.8	44'.1	188° 55'.7	53'.8	189° 17'.1	07'.2	72° 19'.2	54'.8
23 Tuesday									
00	300° 53'.8	147° 42'.4	12° 43'.0 N	203° 56'.4	23° 53'.7 N	204° 19'.0	23° 07'.2 N	87° 21'.6	10° 54'.8 S
01	315° 56'.3	162° 42'.0	41'.8	218° 57'.0	53'.7	219° 20'.9	07'.2	102° 24'.0	54'.9
02	330° 58'.7	177° 41'.6	40'.7	233° 57'.6	53'.6	234° 22'.7	07'.1	117° 26'.4	54'.9
03	346° 01'.2	192° 41'.3	39'.6	248° 58'.3	53'.6	249° 24'.6	07'.1	132° 28'.8	54'.9
04	1° 03'.7	207° 40'.9	38'.5	263° 58'.9	53'.5	264° 26'.5	07'.1	147° 31'.2	55'.0
05	16° 06'.1	222° 40'.5	37'.4	278° 59'.5	53'.4	279° 28'.3	07'.1	162° 33'.6	55'.0
06	31° 08'.6	237° 40'.1	36'.3	294° 00'.2	53'.4	294° 30'.2	07'.0	177° 36'.0	55'.0
07	46° 11'.1	252° 39'.7	35'.2	309° 00'.8	53'.3	309° 32'.1	07'.0	192° 38'.5	55'.0
08	61° 13'.5	267° 39'.3	34'.1	324° 01'.4	53'.3	324° 34'.0	07'.0	207° 40'.9	55'.1
09	76° 16'.0	282° 38'.9	33'.0	339° 02'.1	53'.2	339° 35'.8	07'.0	222° 43'.3	55'.1
10	91° 18'.5	297° 38'.5	31'.9	354° 02'.7	53'.1	354° 37'.7	07'.0	237° 45'.7	55'.1
11	106° 20'.9	312° 38'.1	30'.7	9° 03'.3	53'.1	9° 39'.6	06'.9	252° 48'.1	55'.2
12	121° 23'.4	327° 37'.7	12° 29'.6 N	24° 04'.0	23° 53'.0 N	24° 41'.5	23° 06'.9 N	267° 50'.5	10° 55'.2 S
13	136° 25'.8	342° 37'.3	28'.5	39° 04'.6	53'.0	39° 43'.3	06'.9	282° 52'.9	55'.2
14	151° 28'.3	357° 36'.9	27'.4	54° 05'.3	52'.9	54° 45'.2	06'.9	297° 55'.3	55'.3
15	166° 30'.8	12° 36'.5	26'.3	69° 05'.9	52'.8	69° 47'.1	06'.9	312° 57'.7	55'.3
16	181° 33'.2	27° 36'.1	25'.2	84° 06'.5	52'.8	84° 48'.9	06'.8	328° 00'.1	55'.3
17	196° 35'.7	42° 35'.7	24'.1	99° 07'.2	52'.7	99° 50'.8	06'.8	343° 02'.5	55'.4
18	211° 38'.2	57° 35'.3	22'.9	114° 07'.8	52'.7	114° 52'.7	06'.8	358° 04'.9	55'.4
19	226° 40'.6	72° 35'.0	21'.8	129° 08'.4	52'.6	129° 54'.6	06'.8	13° 07'.3	55'.4
20	241° 43'.1	87° 34'.6	20'.7	144° 09'.1	52'.5	144° 56'.4	06'.7	28° 09'.8	55'.5
21	256° 45'.6	102° 34'.2	19'.6	159° 09'.7	52'.5	159° 58'.3	06'.7	43° 12'.2	55'.5
22	271° 48'.0	117° 33'.8	18'.5	174° 10'.3	52'.4	175° 00'.2	06'.7	58° 14'.6	55'.5
23	286° 50'.5	132° 33'.4	17'.4	189° 11'.0	52'.3	190° 02'.1	06'.7	73° 17'.0	55'.5
	M.P. 03:56	v -0'.4	d 1'.1	v 0'.6	d 0'.1	v 1'.9	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.4	40° 14'.8 S
Achernar	335° 26'.7	57° 09'.8 S
Acrux	173° 09'.4	63° 10'.8 S
Adhara	255° 12'.8	28° 59'.5 S
Aldebaran	290° 49'.5	16° 32'.0 N
Alioth	166° 20'.8	55° 53'.4 N
Alkaid	152° 58'.9	49° 15'.0 N
Alnair	27° 43'.2	46° 53'.4 S
Alnilam	275° 46'.5	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.8	26° 40'.4 N
Alpheratz	357° 43'.2	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.5	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.2	69° 03'.2 S
Avior	234° 18'.6	59° 33'.4 S
Bellatrix	278° 32'.2	6° 21'.6 N
Betelgeuse	271° 01'.5	7° 24'.4 N
Canopus	263° 56'.6	52° 42'.2 S
Capella	280° 34'.7	46° 00'.4 N
Deneb	49° 30'.9	45° 19'.9 N
Denebola	182° 33'.7	14° 29'.8 N
Diphda	348° 55'.7	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.8 N
Elnath	278° 12'.8	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.5 N
Enif	33° 46'.7	9° 56'.4 N
Fomalhaut	15° 23'.6	29° 32'.7 S
Gacrux	172° 00'.9	57° 11'.6 S
Gienah	175° 52'.3	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.5 S
Hamal	328° 00'.6	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.8	74° 06'.3 N
Markab	13° 38'.0	15° 16'.8 N
Menkar	314° 15'.0	4° 08'.6 N
Menkent	148° 07'.4	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.6 S
Mirfak	308° 40'.4	49° 54'.3 N
Nunki	75° 57'.8	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.2 S
Polaris	317° 49'.8	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.2	8° 11'.2 S
Rigil Kent	139° 51'.3	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.1	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 34'.0	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.4 S
Vega	80° 38'.5	38° 48'.1 N
Zuben'ubi	137° 05'.2	16° 05'.9 S

	SHA	Mer.Pass.
Venus	207° 57'.5	14:09
Mars	263° 46'.5	10:25
Jupiter	263° 39'.4	10:24
Saturn	146° 29'.0	18:11

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP
178° 24'.1	20° 28'.5 N	25° 21'.7	3'.5	19° 33'.8 S	3'.2	61'.1
193° 24'.1	28'.1	39° 44'.2	3'.6	30'.6	3'.3	
208° 24'.0	27'.6	54° 06'.8	3'.5	27'.3	3'.4	
223° 24'.0	27'.1	68° 29'.3	3'.6	23'.9	3'.6	
238° 24'.0	26'.6	82° 51'.9	3'.6	20'.3	3'.8	
253° 23'.9	26'.1	97° 14'.5	3'.6	16'.5	3'.9	
268° 23'.9	25'.6	111° 37'.1	3'.7	12'.6	4'.0	
283° 23'.9	25'.2	125° 59'.8	3'.6	08'.6	4'.2	
298° 23'.9	24'.7	140° 22'.4	3'.7	04'.4	4'.3	
313° 23'.8	24'.2	154° 45'.1	3'.7	00'.1	4'.5	
328° 23'.8	23'.7	169° 07'.8	3'.8	18° 55'.6 S	4'.6	61'.2
343° 23'.8	23'.2	183° 30'.6	3'.7	51'.0	4'.7	
358° 23'.7	20° 22'.7 N	197° 53'.3	3'.8	18° 46'.3 S	4'.9	61'.2
13° 23'.7	22'.2	212° 16'.1	3'.8	41'.4	5'.0	
28° 23'.7	21'.7	226° 38'.9	3'.9	36'.4	5'.2	
43° 23'.7	21'.3	241° 01'.8	3'.9	31'.2	5'.3	
58° 23'.6	20'.8	255° 24'.7	3'.9	25'.9	5'.4	
73° 23'.6	20'.3	269° 47'.6	4'.0	20'.5	5'.6	
88° 23'.6	19'.8	284° 10'.6	4'.0	14'.9	5'.7	
103° 23'.6	19'.3	298° 33'.6	4'.0	09'.2	5'.8	
118° 23'.5	18'.8	312° 56'.6	4'.1	03'.4	6'.0	
133° 23'.5	18'.3	327° 19'.7	4'.2	17° 57'.4 S	6'.1	
148° 23'.5	17'.8	341° 42'.9	4'.1	51'.3	6'.3	
163° 23'.5	17'.3	356° 06'.0	4'.3	45'.0	6'.3	
178° 23'.4	20° 16'.8 N	10° 29'.3	4'.2	17° 38'.7 S	6'.5	61'.2
193° 23'.4	16'.3	24° 52'.5	4'.4	32'.2	6'.6	
208° 23'.4	15'.8	39° 15'.9	4'.3	25'.6	6'.8	
223° 23'.4	15'.3	53° 39'.2	4'.5	18'.8	6'.9	
238° 23'.3	14'.8	68° 02'.7	4'.5	11'.9	7'.0	
253° 23'.3	14'.3	82° 26'.2	4'.5	04'.9	7'.1	
268° 23'.3	13'.8	96° 49'.7	4'.6	16° 57'.8 S	7'.2	
283° 23'.3	13'.3	111° 13'.3	4'.6	50'.6	7'.4	
298° 23'.3	12'.8	125° 36'.9	4'.7	43'.2	7'.5	61'.1
313° 23'.2	12'.3	140° 00'.6	4'.8	35'.7	7'.6	
328° 23'.2	11'.8	154° 24'.4	4'.8	28'.1	7'.7	
343° 23'.2	11'.3	168° 48'.2	4'.9	20'.4	7'.8	
358° 23'.2	20° 10'.8 N	183° 12'.1	5'.0	16° 12'.6 S	7'.9	61'.1
13° 23'.2	10'.3	197° 36'.1	5'.0	04'.7	8'.1	
28° 23'.1	09'.8	212° 00'.1	5'.0	15° 56'.6 S	8'.2	
43° 23'.1	09'.3	226° 24'.1	5'.2	48'.4	8'.2	
58° 23'.1	08'.8	240° 48'.3	5'.2	40'.2	8'.4	
73° 23'.1	08'.3	255° 12'.5	5'.3	31'.8	8'.5	
88° 23'.1	07'.8	269° 36'.8	5'.3	23'.3	8'.6	
103° 23'.0	07'.3	284° 01'.1	5'.4	14'.7	8'.7	61'.0
118° 23'.0	06'.8	298° 25'.5	5'.5	06'.0	8'.8	
133° 23'.0	06'.3	312° 50'.0	5'.5	14° 57'.2 S	8'.9	
148° 23'.0	05'.8	327° 14'.5	5'.6	48'.3	9'.0	
163° 23'.0	05'.3	341° 39'.1	5'.7	39'.3	9'.1	
178° 22'.9	20° 04'.7 N	356° 03'.8	5'.8	14° 30'.2 S	9'.2	61'.0
193° 22'.9	04'.2	10° 28'.6	5'.8	21'.0	9'.2	
208° 22'.9	03'.7	24° 53'.4	5'.9	11'.8	9'.4	60'.9
223° 22'.9	03'.2	39° 18'.3	5'.9	02'.4	9'.5	
238° 22'.9	02'.7	53° 43'.2	6'.1	13° 52'.9 S	9'.5	
253° 22'.9	02'.2	68° 08'.3	6'.1	43'.4	9'.7	
268° 22'.8	01'.7	82° 33'.4	6'.2	33'.7	9'.7	
283° 22'.8	01'.2	96° 58'.6	6'.2	24'.0	9'.8	
298° 22'.8	00'.6	111° 23'.8	6'.4	14'.2	9'.9	60'.8
313° 22'.8	00'.1	125° 49'.2	6'.4	04'.3	10'.0	
328° 22'.8	19° 59'.6 N	140° 14'.6	6'.5	12° 54'.3 S	10'.0	
343° 22'.8	59'.1	154° 40'.1	6'.5	44'.3	10'.2	
358° 22'.7	19° 58'.6 N	169° 05'.6	6'.6	12° 34'.1 S	10'.2	60'.8
13° 22'.7	58'.1	183° 31'.2	6'.7	23'.9	10'.3	60'.7
28° 22'.7	57'.5	197° 56'.9	6'.8	13'.6	10'.3	
43° 22'.7	57'.0	212° 22'.7	6'.9	03'.3	10'.4	
58° 22'.7	56'.5	226° 48'.6	6'.9	11° 52'.9 S	10'.5	
73° 22'.7	56'.0	241° 14'.5	7'.0	42'.4	10'.6	60'.6
88° 22'.7	55'.5	255° 40'.5	7'.1	31'.8	10'.7	
103° 22'.7	54'.9	270° 06'.6	7'.2	21'.1	10'.6	
118° 22'.6	54'.4	284° 32'.8	7'.2	10'.5	10'.8	
133° 22'.6	53'.9	298° 59'.0	7'.3	10° 59'.7 S	10'.8	
148° 22'.6	53'.4	313° 25'.3	7'.4	48'.9	10'.9	60'.5
163° 22'.6	52'.9	327° 51'.7	7'.4	38'.0	11'.0	
SD 15'.7	d 0'.5	SD 16'.7		16'.7	16'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23
N 72°	-	-	-	22:55	21:53	21:33
N 70°	-	-	-	21:27	21:21	21:15
68°	-	-	01:15	20:47	20:57	21:01
66°	-	-	02:06	20:20	20:38	20:49
64°	-	-	02:37	19:58	20:23	20:39
62°	-	01:32	03:00	19:41	20:10	20:31
60°	-	02:08	03:18	19:27	19:59	20:24
N 58°	-	02:34	03:33	19:14	19:50	20:17
56°	01:24	02:53	03:46	19:04	19:42	20:11
54°	01:57	03:10	03:57	18:54	19:34	20:06
52°	02:21	03:23	04:07	18:46	19:28	20:02
50°	02:40	03:35	04:16	18:38	19:21	19:57
45°	03:14	03:59	04:34	18:22	19:08	19:48
N 40°	03:39	04:18	04:49	18:09	18:58	19:40
35°	03:59	04:34	05:02	17:58	18:48	19:34
30°	04:15	04:47	05:13	17:48	18:40	19:28
20°	04:40	05:08	05:32	17:31	18:26	19:18
N 10°	04:59	05:25	05:48	17:16	18:14	19:09
0°	05:15	05:41	06:03	17:02	18:02	19:00
S 10°	05:30	05:55	06:18	16:48	17:51	18:52
20°	05:43	06:10	06:33	16:33	17:38	18:43
30°	05:57	06:26	06:51	16:16	17:24	18:32
35°	06:04	06:34	07:02	16:06	17:16	18:27
40°	06:11	06:44	07:14	15:54	17:07	18:20
45°	06:19	06:55	07:28	15:41	16:55	18:12
S 50°	06:28	07:08	07:44	15:24	16:42	18:02
52°	06:32	07:14	07:52	15:16	16:36	17:58
54°	06:36	07:20	08:01	15:08	16:29	17:53
56°	06:41	07:28	08:11	14:58	16:21	17:47
58°	06:46	07:36	08:23	14:47	16:12	17:41
S 60°	06:51	07:45	08:36	14:34	16:02	17:34
S 62°	06:57	07:55	08:51	14:19	15:51	17:27

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 21	Moonset 22	Moonset 23
N 72°	-	-	-	23:49	-	02:58
N 70°	-	-	-	-	01:17	03:29
68°	22:51	-	-	00:09	01:56	03:51
66°	22:04	-	-	00:46	02:23	04:09
64°	21:34	-	-	01:13	02:43	04:23
62°	21:11	22:37	-	01:34	03:00	04:35
60°	20:53	22:02	-	01:50	03:14	04:45
N 58°	20:38	21:37	-	02:04	03:26	04:54
56°	20:26	21:18	22:45	02:16	03:36	05:01
54°	20:15	21:02	22:13	02:27	03:45	05:08
52°	20:05	20:48	21:50	02:36	03:53	05:14
50°	19:56	20:37	21:32	02:45	04:00	05:20
45°	19:38	20:13	20:58	03:03	04:15	05:31
N 40°	19:23	19:54	20:33	03:17	04:28	05:41
35°	19:10	19:39	20:14	03:29	04:39	05:50
30°	19:00	19:26	19:58	03:40	04:48	05:57
20°	18:41	19:05	19:33	03:58	05:04	06:09
N 10°	18:25	18:47	19:14	04:14	05:18	06:20
0°	18:10	18:32	18:58	04:29	05:31	06:30
S 10°	17:55	18:18	18:43	04:44	05:44	06:40
20°	17:40	18:03	18:30	04:59	05:57	06:51
30°	17:22	17:47	18:17	05:17	06:13	07:03
35°	17:11	17:39	18:10	05:28	06:22	07:10
40°	17:00	17:29	18:02	05:40	06:32	07:18
45°	16:46	17:18	17:54	05:54	06:44	07:27
S 50°	16:29	17:05	17:45	06:11	06:58	07:38
52°	16:21	16:59	17:41	06:19	07:05	07:43
54°	16:12	16:53	17:37	06:28	07:13	07:48
56°	16:02	16:46	17:33	06:38	07:21	07:55
58°	15:51	16:38	17:28	06:49	07:30	08:01
S 60°	15:38	16:29	17:22	07:02	07:41	08:09
S 62°	15:22	16:19	17:16	07:17	07:53	08:18

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
21	6 24	6 25	12:06	23:16	10:45	13d 97%
22	6 26	6 27	12:06	24:16	11:47	14d Full
23	6 28	6 29	12:06	00:16	12:45	15d 99%

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2013 July 24, 25, 26 (Wed, Thur, Fri)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
24 Wednesday									
00	301° 53'.0	147° 33'.0	12° 16'.2 N	204° 11'.6	23° 52'.3 N	205° 03'.9	23° 06'.7 N	88° 19'.4	10° 55'.6 S
01	316° 55'.4	162° 32'.6	15'.1	219° 12'.3	52'.2	220° 05'.8	06'.6	103° 21'.8	55'.6
02	331° 57'.9	177° 32'.2	14'.0	234° 12'.9	52'.2	235° 07'.7	06'.6	118° 24'.2	55'.6
03	347° 00'.3	192° 31'.9	12'.9	249° 13'.5	52'.1	250° 09'.6	06'.6	133° 26'.6	55'.7
04	2° 02'.8	207° 31'.5	11'.7	264° 14'.2	52'.0	265° 11'.4	06'.6	148° 29'.0	55'.7
05	17° 05'.3	222° 31'.1	10'.6	279° 14'.8	52'.0	280° 13'.3	06'.5	163° 31'.4	55'.7
06	32° 07'.7	237° 30'.7	09'.5	294° 15'.4	51'.9	295° 15'.2	06'.5	178° 33'.8	55'.8
07	47° 10'.2	252° 30'.3	08'.4	309° 16'.1	51'.8	310° 17'.1	06'.5	193° 36'.2	55'.8
08	62° 12'.7	267° 29'.9	07'.3	324° 16'.7	51'.8	325° 18'.9	06'.5	208° 38'.6	55'.8
09	77° 15'.1	282° 29'.6	06'.1	339° 17'.4	51'.7	340° 20'.8	06'.5	223° 41'.0	55'.9
10	92° 17'.6	297° 29'.2	05'.0	354° 18'.0	51'.6	355° 22'.7	06'.4	238° 43'.4	55'.9
11	107° 20'.1	312° 28'.8	03'.9	9° 18'.6	51'.6	10° 24'.6	06'.4	253° 45'.8	55'.9
12	122° 22'.5	327° 28'.4	12° 02'.8 N	24° 19'.3	23° 51'.5 N	25° 26'.4	23° 06'.4 N	268° 48'.2	10° 56'.0 S
13	137° 25'.0	342° 28'.0	01'.6	39° 19'.9	51'.4	40° 28'.3	06'.4	283° 50'.7	56'.0
14	152° 27'.5	357° 27'.6	00'.5	54° 20'.6	51'.3	55° 30'.2	06'.3	298° 53'.1	56'.0
15	167° 29'.9	12° 27'.3	11° 59'.4 N	69° 21'.2	51'.3	70° 32'.1	06'.3	313° 55'.5	56'.1
16	182° 32'.4	27° 26'.9	58'.2	84° 21'.8	51'.2	85° 33'.9	06'.3	328° 57'.9	56'.1
17	197° 34'.8	42° 26'.5	57'.1	99° 22'.5	51'.1	100° 35'.8	06'.3	344° 00'.3	56'.1
18	212° 37'.3	57° 26'.1	56'.0	114° 23'.1	51'.1	115° 37'.7	06'.3	359° 02'.7	56'.2
19	227° 39'.8	72° 25'.8	54'.9	129° 23'.8	51'.0	130° 39'.6	06'.2	14° 05'.1	56'.2
20	242° 42'.2	87° 25'.4	53'.7	144° 24'.4	50'.9	145° 41'.4	06'.2	29° 07'.5	56'.2
21	257° 44'.7	102° 25'.0	52'.6	159° 25'.0	50'.9	160° 43'.3	06'.2	44° 09'.9	56'.3
22	272° 47'.2	117° 24'.6	51'.5	174° 25'.7	50'.8	175° 45'.2	06'.2	59° 12'.3	56'.3
23	287° 49'.6	132° 24'.2	50'.3	189° 26'.3	50'.7	190° 47'.1	06'.1	74° 14'.7	56'.3
25 Thursday									
00	302° 52'.1	147° 23'.9	11° 49'.2 N	204° 27'.0	23° 50'.6 N	205° 48'.9	23° 06'.1 N	89° 17'.1	10° 56'.4 S
01	317° 54'.6	162° 23'.5	48'.1	219° 27'.6	50'.6	220° 50'.8	06'.1	104° 19'.5	56'.4
02	332° 57'.0	177° 23'.1	46'.9	234° 28'.2	50'.5	235° 52'.7	06'.1	119° 21'.9	56'.4
03	347° 59'.5	192° 22'.7	45'.8	249° 28'.9	50'.4	250° 54'.6	06'.1	134° 24'.3	56'.5
04	3° 01'.9	207° 22'.4	44'.7	264° 29'.5	50'.4	265° 56'.4	06'.0	149° 26'.7	56'.5
05	18° 04'.4	222° 22'.0	43'.5	279° 30'.2	50'.3	280° 58'.3	06'.0	164° 29'.1	56'.5
06	33° 06'.9	237° 21'.6	42'.4	294° 30'.8	50'.2	296° 00'.2	06'.0	179° 31'.5	56'.6
07	48° 09'.3	252° 21'.3	41'.3	309° 31'.4	50'.1	311° 02'.1	06'.0	194° 33'.9	56'.6
08	63° 11'.8	267° 20'.9	40'.1	324° 32'.1	50'.1	326° 03'.9	05'.9	209° 36'.3	56'.6
09	78° 14'.3	282° 20'.5	39'.0	339° 32'.7	50'.0	341° 05'.8	05'.9	224° 38'.7	56'.7
10	93° 16'.7	297° 20'.1	37'.8	354° 33'.4	49'.9	356° 07'.7	05'.9	239° 41'.1	56'.7
11	108° 19'.2	312° 19'.8	36'.7	9° 34'.0	49'.8	11° 09'.6	05'.9	254° 43'.5	56'.7
12	123° 21'.7	327° 19'.4	11° 35'.6 N	24° 34'.6	23° 49'.7 N	26° 11'.5	23° 05'.8 N	269° 45'.9	10° 56'.8 S
13	138° 24'.1	342° 19'.0	34'.4	39° 35'.3	49'.7	41° 13'.3	05'.8	284° 48'.3	56'.8
14	153° 26'.6	357° 18'.7	33'.3	54° 35'.9	49'.6	56° 15'.2	05'.8	299° 50'.7	56'.8
15	168° 29'.1	12° 18'.3	32'.2	69° 36'.6	49'.5	71° 17'.1	05'.8	314° 53'.1	56'.9
16	183° 31'.5	27° 17'.9	31'.0	84° 37'.2	49'.4	86° 19'.0	05'.8	329° 55'.5	56'.9
17	198° 34'.0	42° 17'.6	29'.9	99° 37'.9	49'.4	101° 20'.8	05'.7	344° 57'.9	56'.9
18	213° 36'.4	57° 17'.2	28'.7	114° 38'.5	49'.3	116° 22'.7	05'.7	0° 00'.3	57'.0
19	228° 38'.9	72° 16'.8	27'.6	129° 39'.1	49'.2	131° 24'.6	05'.7	15° 02'.7	57'.0
20	243° 41'.4	87° 16'.5	26'.4	144° 39'.8	49'.1	146° 26'.5	05'.7	30° 05'.1	57'.0
21	258° 43'.8	102° 16'.1	25'.3	159° 40'.4	49'.0	161° 28'.3	05'.6	45° 07'.5	57'.1
22	273° 46'.3	117° 15'.7	24'.2	174° 41'.1	49'.0	176° 30'.2	05'.6	60° 09'.9	57'.1
23	288° 48'.8	132° 15'.4	23'.0	189° 41'.7	48'.9	191° 32'.1	05'.6	75° 12'.3	57'.1
26 Friday									
00	303° 51'.2	147° 15'.0	11° 21'.9 N	204° 42'.4	23° 48'.8 N	206° 34'.0	23° 05'.6 N	90° 14'.7	10° 57'.2 S
01	318° 53'.7	162° 14'.6	20'.7	219° 43'.0	48'.7	221° 35'.9	05'.5	105° 17'.1	57'.2
02	333° 56'.2	177° 14'.3	19'.6	234° 43'.6	48'.6	236° 37'.7	05'.5	120° 19'.5	57'.2
03	348° 58'.6	192° 13'.9	18'.4	249° 44'.3	48'.6	251° 39'.6	05'.5	135° 21'.9	57'.3
04	4° 01'.1	207° 13'.5	17'.3	264° 44'.9	48'.5	266° 41'.5	05'.5	150° 24'.3	57'.3
05	19° 03'.6	222° 13'.2	16'.1	279° 45'.6	48'.4	281° 43'.4	05'.4	165° 26'.7	57'.3
06	34° 06'.0	237° 12'.8	15'.0	294° 46'.2	48'.3	296° 45'.3	05'.4	180° 29'.1	57'.4
07	49° 08'.5	252° 12'.5	13'.8	309° 46'.9	48'.2	311° 47'.1	05'.4	195° 31'.5	57'.4
08	64° 10'.9	267° 12'.1	12'.7	324° 47'.5	48'.1	326° 49'.0	05'.4	210° 33'.9	57'.4
09	79° 13'.4	282° 11'.7	11'.5	339° 48'.1	48'.1	341° 50'.9	05'.3	225° 36'.3	57'.5
10	94° 15'.9	297° 11'.4	10'.4	354° 48'.8	48'.0	356° 52'.8	05'.3	240° 38'.7	57'.5
11	109° 18'.3	312° 11'.0	09'.2	9° 49'.4	47'.9	11° 54'.6	05'.3	255° 41'.1	57'.5
12	124° 20'.8	327° 10'.7	11° 08'.1 N	24° 50'.1	23° 47'.8 N	26° 56'.5	23° 05'.3 N	270° 43'.5	10° 57'.6 S
13	139° 23'.3	342° 10'.3	06'.9	39° 50'.7	47'.7	41° 58'.4	05'.3	285° 45'.9	57'.6
14	154° 25'.7	357° 09'.9	05'.8	54° 51'.4	47'.6	57° 00'.3	05'.2	300° 48'.3	57'.7
15	169° 28'.2	12° 09'.6	04'.6	69° 52'.0	47'.6	72° 02'.2	05'.2	315° 50'.7	57'.7
16	184° 30'.7	27° 09'.2	03'.5	84° 52'.7	47'.5	87° 04'.0	05'.2	330° 53'.1	57'.7
17	199° 33'.1	42° 08'.9	02'.3	99° 53'.3	47'.4	102° 05'.9	05'.2	345° 55'.5	57'.8
18	214° 35'.6	57° 08'.5	01'.2	114° 53'.9	47'.3	117° 07'.8	05'.1	0° 57'.8	57'.8
19	229° 38'.0	72° 08'.2	00'.0	129° 54'.6	47'.2	132° 09'.7	05'.1	16° 00'.2	57'.8
20	244° 40'.5	87° 07'.8	10° 58'.9 N	144° 55'.2	47'.1	147° 11'.6	05'.1	31° 02'.6	57'.9
21	259° 43'.0	102° 07'.4	57'.7	159° 55'.9	47'.0	162° 13'.4	05'.1	46° 05'.0	57'.9
22	274° 45'.4	117° 07'.1	56'.6	174° 56'.5	46'.9	177° 15'.3	05'.0	61° 07'.4	57'.9
23	289° 47'.9	132° 06'.7	55'.4	189° 57'.2	46'.9	192° 17'.2	05'.0	76° 09'.8	58'.0
	M.P. 03:44	v -0'.4	d 1'.1	v 0'.6	d 0'.1	v 1'.9	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.4	40° 14'.8 S
Achernar	335° 26'.7	57° 09'.7 S
Acrux	173° 09'.4	63° 10'.8 S
Adhara	255° 12'.8	28° 59'.5 S
Aldebaran	290° 49'.5	16° 32'.1 N
Alioth	166° 20'.8	55° 53'.4 N
Alkaid	152° 58'.9	49° 15'.0 N
Alnair	27° 43'.2	46° 53'.4 S
Alnilam	275° 46'.5	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.8	26° 40'.4 N
Alpheratz	357° 43'.2	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.5	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.2	69° 03'.2 S
Avior	234° 18'.6	59° 33'.3 S
Bellatrix	278° 32'.2	6° 21'.6 N
Betelgeuse	271° 01'.5	7° 24'.5 N
Canopus	263° 56'.6	52° 42'.2 S
Capella	280° 34'.6	46° 00'.4 N
Deneb	49° 30'.9	45° 19'.9 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.7	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.8 N
Elnath	278° 12'.8	28° 36'.9 N
Eltanin	90° 45'.6	51° 29'.6 N
Enif	33° 46'.7	9° 56'.4 N
Fomalhaut	15° 23'.6	29° 32'.7 S
Gacrux	172° 00'.9	57° 11'.6 S
Gienah	175° 52'.3	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.5 S
Hamal	328° 00'.6	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.9	74° 06'.3 N
Markab	13° 38'.0	15° 16'.8 N
Menkar	314° 15'.0	4° 08'.6 N
Menkent	148° 07'.4	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.6 S
Mirfak	308° 40'.3	49° 54'.3 N
Nunki	75° 57'.8	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.2 S
Polaris	317° 48'.4	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	245° 00'.0	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.2	8° 11'.2 S
Rigil Kent	139° 51'.4	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.1	56° 36'.5 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 33'.9	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.4 S
Vega	80° 38'.5	38° 48'.1 N
Zuben'ubi	137° 05'.2	16° 05'.8 S

	SHA	Mer.Pass.
Venus	204° 31'.8	14:11
Mars	261° 34'.9	10:22
Jupiter	262° 56'.8	10:15
Saturn	146° 25'.0	18:00

SUN			
GHA	Dec		
178° 22'.6	19° 52'.3 N		
193° 22'.6	51'.8		
208° 22'.6	51'.3		
223° 22'.6	50'.8		
238° 22'.5	50'.2		
253° 22'.5	49'.7		
268° 22'.5	49'.2		
283° 22'.5	48'.7		
298° 22'.5	48'.1		
313° 22'.5	47'.6		
328° 22'.5	47'.1		
343° 22'.5	46'.5		
358° 22'.5	19° 46'.0 N		
13° 22'.5	45'.5		
28° 22'.5	44'.9		
43° 22'.4	44'.4		
58° 22'.4	43'.9		
73° 22'.4	43'.3		
88° 22'.4	42'.8		
103° 22'.4	42'.3		
118° 22'.4	41'.7		
133° 22'.4	41'.2		
148° 22'.4	40'.7		
163° 22'.4	40'.1		
178° 22'.4	19° 39'.6 N		
193° 22'.4	39'.1		
208° 22'.4	38'.5		
223° 22'.4	38'.0		
238° 22'.4	37'.4		
253° 22'.4	36'.9		
268° 22'.4	36'.4		
283° 22'.4	35'.8		
298° 22'.3	35'.3		
313° 22'.3	34'.7		
328° 22'.3	34'.2		
343° 22'.3	33'.6		
358° 22'.3	19° 33'.1 N		
13° 22'.3	32'.6		
28° 22'.3	32'.0		
43° 22'.3	31'.5		
58° 22'.3	30'.9		
73° 22'.3	30'.4		
88° 22'.3	29'.8		
103° 22'.3	29'.3		
118° 22'.3	28'.7		
133° 22'.3	28'.2		
148° 22'.3	27'.6		
163° 22'.3	27'.1		
178° 22'.3	19° 26'.5 N		
193° 22'.3	26'.0		
208° 22'.3	25'.4		
223° 22'.3	24'.9		
238° 22'.3	24'.3		
253° 22'.3	23'.8		
268° 22'.3	23'.2		
283° 22'.3	22'.7		
298° 22'.3	22'.1		
313° 22'.3	21'.5		
328° 22'.3	21'.0		
343° 22'.3	20'.4		
358° 22'.3	19° 19'.9 N		
13° 22'.4	19'.3		
28° 22'.4	18'.8		
43° 22'.4	18'.2		
58° 22'.4	17'.6		
73° 22'.4	17'.1		
88° 22'.4	16'.5		
103° 22'.4	16'.0		
118° 22'.4	15'.4		
133° 22'.4	14'.8		
148° 22'.4	14'.3		
163° 22'.4	13'.7		
SD 15'.7	d 0'.5		

MOON				
GHA	v	Dec	d	HP
342° 18'.1	7'.6	10° 27'.0 S	11'.0	60'.5
356° 44'.7	7'.6	16'.0	11'.0	60'.4
11° 11'.3	7'.7	05'.0	11'.1	
25° 38'.0	7'.7	9° 53'.9 S	11'.2	
40° 04'.7	7'.8	42'.7	11'.2	
54° 31'.5	7'.9	31'.5	11'.3	60'.3
68° 58'.4	8'.0	20'.2	11'.3	
83° 25'.4	8'.1	08'.9	11'.3	
97° 52'.5	8'.1	8° 57'.6 S	11'.4	
112° 19'.6	8'.2	46'.2	11'.4	60'.2
126° 46'.8	8'.3	34'.8	11'.5	
141° 14'.1	8'.3	23'.3	11'.5	
155° 41'.4	8'.4	8° 11'.8 S	11'.6	60'.1
170° 08'.8	8'.5	00'.2	11'.6	
184° 36'.3	8'.5	7° 48'.6 S	11'.6	
199° 03'.8	8'.7	37'.0	11'.7	60'.0
213° 31'.5	8'.7	25'.3	11'.7	
227° 59'.2	8'.7	13'.6	11'.7	
242° 26'.9	8'.9	01'.9	11'.7	59'.9
256° 54'.8	8'.9	6° 50'.2 S	11'.8	
271° 22'.7	8'.9	38'.4	11'.8	
285° 50'.6	9'.1	26'.6	11'.8	59'.8
300° 18'.7	9'.1	14'.8	11'.9	
314° 46'.8	9'.1	02'.9	11'.9	
329° 14'.9	9'.3	5° 51'.0 S	11'.9	59'.7
343° 43'.2	9'.3	39'.1	11'.9	
358° 11'.5	9'.3	27'.2	11'.9	
12° 39'.8	9'.5	15'.3	11'.9	59'.6
27° 08'.3	9'.4	03'.4	12'.0	
41° 36'.7	9'.6	4° 51'.4 S	12'.0	
56° 05'.3	9'.6	39'.4	11'.9	59'.5
70° 33'.9	9'.7	27'.5	12'.0	
85° 02'.6	9'.7	15'.5	12'.0	
99° 31'.3	9'.8	03'.5	12'.0	59'.4
114° 00'.1	9'.9	3° 51'.5 S	12'.1	
128° 29'.0	9'.9	39'.4	12'.0	59'.3
142° 57'.9	10'.0	3° 27'.4 S	12'.0	59'.3
157° 26'.9	10'.0	15'.4	12'.0	
171° 55'.9	10'.1	03'.4	12'.0	59'.2
186° 25'.0	10'.1	2° 51'.4 S	12'.1	
200° 54'.1	10'.3	39'.3	12'.0	
215° 23'.4	10'.2	27'.3	12'.0	59'.1
229° 52'.6	10'.3	15'.3	12'.0	
244° 21'.9	10'.4	03'.3	12'.0	59'.0
258° 51'.3	10'.4	1° 51'.3 S	12'.0	
273° 20'.7	10'.5	39'.3	12'.0	
287° 50'.2	10'.5	27'.3	12'.0	58'.9
302° 19'.7	10'.6	15'.3	12'.0	
316° 49'.3	10'.6	1° 03'.3 S	12'.0	58'.9
331° 18'.9	10'.6	0° 51'.3 S	11'.9	58'.8
345° 48'.5	10'.8	39'.4	12'.0	
0° 18'.3	10'.7	27'.4	11'.9	58'.7
14° 48'.0	10'.8	15'.5	11'.9	
29° 17'.8	10'.9	03'.6	11'.9	
43° 47'.7	10'.9	0° 08'.3 N	11'.9	58'.6
58° 17'.6	11'.0	20'.2	11'.8	
72° 47'.6	10'.9	32'.0	11'.9	58'.5
87° 17'.5	11'.1	43'.9	11'.8	
101° 47'.6	11'.1	55'.7	11'.8	
116° 17'.7	11'.1	1° 07'.5 N	11'.8	58'.4
130° 47'.8	11'.1	1° 19'.3 N	11'.7	58'.4
145° 17'.9	11'.2	31'.0	11'.7	58'.3
159° 48'.1	11'.3	42'.7	11'.7	
174° 18'.4	11'.3	54'.4	11'.7	
188° 48'.7	11'.3	2° 06'.1 N	11'.6	58'.2
203° 19'.0	11'.3	17'.7	11'.6	
217° 49'.3	11'.4	29'.3	11'.6	58'.1
232° 19'.7	11'.5	40'.9	11'.6	
246° 50'.2	11'.4	52'.5	11'.5	
261° 20'.6	11'.5	3° 04'.0 N	11'.5	58'.0
275° 51'.1	11'.6	15'.5	11'.4	
290° 21'.7	11'.5	26'.9	11'.4	57'.9
SD	16'.4	16'.2	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 24	Moonrise 25	Moonrise 26
N 72°	-	-	-	21:20	21:09	20:58
N 70°	-	-	-	21:11	21:07	21:02
68°	-	-	01:36	21:03	21:05	21:06
66°	-	-	02:18	20:57	21:03	21:08
64°	-	00:46	02:46	20:52	21:02	21:11
62°	-	01:46	03:08	20:47	21:00	21:13
60°	-	02:18	03:25	20:43	20:59	21:15
N 58°	00:42	02:41	03:39	20:39	20:58	21:16
56°	01:36	03:00	03:51	20:36	20:57	21:18
54°	02:06	03:15	04:02	20:33	20:57	21:19
52°	02:28	03:28	04:11	20:30	20:56	21:20
50°	02:46	03:40	04:20	20:28	20:55	21:21
45°	03:19	04:03	04:38	20:23	20:54	21:24
N 40°	03:43	04:21	04:52	20:18	20:53	21:26
35°	04:01	04:36	05:04	20:14	20:52	21:27
30°	04:17	04:48	05:15	20:11	20:51	21:29
20°	04:41	05:09	05:33	20:05	20:49	21:32
N 10°	05:00	05:26	05:49	20:00	20:48	21:34
0°	05:16	05:41	06:03	19:55	20:47	21:36
S 10°	05:29	05:55	06:17	19:50	20:46	21:39
20°	05:42	06:09	06:33	19:45	20:44	21:41
30°	05:55	06:24	06:50	19:39	20:43	21:44
35°	06:02	06:33	07:00	19:35	20:42	21:46
40°	06:09	06:42	07:11	19:32	20:41	21:48
45°	06:17	06:52	07:25	19:27	20:40	21:50
S 50°	06:25	07:05	07:41	19:22	20:39	21:53
52°	06:29	07:10	07:48	19:19	20:38	21:54
54°	06:33	07:17	07:57	19:16	20:37	21:55
56°	06:37	07:23	08:06	19:13	20:37	21:57
58°	06:42	07:31	08:17	19:10	20:36	21:58
S 60°	06:47	07:39	08:30	19:06	20:35	22:00
S 62°	06:53	07:49	08:45	19:02	20:34	22:02

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 24	Moonset 25	Moonset 26
N 72°	-	-	-	05:16	07:22	09:19
N 70°	-	-	-	05:32	07:28	09:18
68°	22:32	-	-	05:45	07:34	09:18
66°	21:52	-	-	05:55	07:38	09:17
64°	21:24	23:17	-	06:04	07:42	09:17
62°	21:03	22:23	-	06:11	07:45	09:16
60°	20:47	21:52	-	06:18	07:48	09:16
N 58°	20:33	21:30	23:22	06:23	07:51	09:15
56°	20:20	21:11	22:33	06:28	07:53	09:15
54°	20:10	20:56	22:04	06:32	07:55	09:15
52°	20:01	20:43	21:43	06:36	07:57	09:14
50°	19:52	20:32	21:26	06:40	07:58	09:14
45°	19:35	20:09	20:53	06:48	08:02	09:14
N 40°	19:20	19:51	20:30	06:54	08:05	09:13
35°	19:08	19:37	20:11	07:00	08:07	09:13
30°	18:58	19:24	19:56	07:04	08:10	09:12
20°	18:40	19:04	19:32	07:13	08:13	09:12
N 10°	18:24	18:47	19:13	07:20	08:17	09:11
0°	18:10	18:32	18:57	07:27	08:20	09:11
S 10°	17:56	18:18	18:44	07:33	08:23	09:10
20°	17:41	18:04	18:31	07:40	08:26	09:09
30°	17:23	17:49	18:18	07:48	08:30	09:09
35°	17:14	17:41	18:11	07:53	08:32	09:08
40°	17:02	17:31	18:04	07:58	08:34	09:08
45°	16:49	17:21	17:57	08:04	08:37	09:07
S 50°	16:33	17:09	17:48	08:11	08:40	09:07
52°	16:25	17:03	17:45	08:14	08:41	09:06
54°	16:17	16:57	17:41	08:18	08:43	09:06
56°	16:07	16:50	17:36	08:22	08:45	09:06
58°	15:56	16:43	17:32	08:26	08:47	09:05
S 60°	15:44	16:34	17:27	08:31	08:49	09:05
S 62°	15:29	16:25	17:21	08:36	08:51	09:04

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON ◯ Age/ Vis
24	6 30	6 30	12:07	01:14	13:41	16d 95%
25	6 30	6 31	12:07	02:07	14:33	17d 89%
26	6 31	6 31	12:07	02:59	15:24	18d 82%

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2013 July 27, 28, 29 (Sat, Sun, Mon)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
27 Saturday 00	304° 50'.4	147° 06'.4	10° 54'.3 N	204° 57'.8	23° 46'.8 N	207° 19'.1	23° 05'.0 N	91° 12'.2	10° 58'.0 S
01	319° 52'.8	162° 06'.0	53'.1	219° 58'.5	46'.7	222° 21'.0	05'.0	106° 14'.6	58'.0
02	334° 55'.3	177° 05'.7	51'.9	234° 59'.1	46'.6	237° 22'.8	04'.9	121° 17'.0	58'.1
03	349° 57'.8	192° 05'.3	50'.8	249° 59'.8	46'.5	252° 24'.7	04'.9	136° 19'.4	58'.1
04	5° 00'.2	207° 05'.0	49'.6	265° 00'.4	46'.4	267° 26'.6	04'.9	151° 21'.8	58'.1
05	20° 02'.7	222° 04'.6	48'.5	280° 01'.1	46'.3	282° 28'.5	04'.9	166° 24'.2	58'.2
06	35° 05'.2	237° 04'.3	47'.3	295° 01'.7	46'.2	297° 30'.4	04'.8	181° 26'.6	58'.2
07	50° 07'.6	252° 03'.9	46'.1	310° 02'.3	46'.1	312° 32'.2	04'.8	196° 29'.0	58'.3
08	65° 10'.1	267° 03'.6	45'.0	325° 03'.0	46'.0	327° 34'.1	04'.8	211° 31'.4	58'.3
09	80° 12'.5	282° 03'.2	43'.8	340° 03'.6	46'.0	342° 36'.0	04'.8	226° 33'.8	58'.3
10	95° 15'.0	297° 02'.9	42'.7	355° 04'.3	45'.9	357° 37'.9	04'.7	241° 36'.2	58'.4
11	110° 17'.5	312° 02'.5	41'.5	10° 04'.9	45'.8	12° 39'.8	04'.7	256° 38'.6	58'.4
12	125° 19'.9	327° 02'.2	10° 40'.3 N	25° 05'.6	23° 45'.7 N	27° 41'.6	23° 04'.7 N	271° 40'.9	10° 58'.4 S
13	140° 22'.4	342° 01'.8	39'.2	40° 06'.2	45'.6	42° 43'.5	04'.7	286° 43'.3	58'.5
14	155° 24'.9	357° 01'.5	38'.0	55° 06'.9	45'.5	57° 45'.4	04'.6	301° 45'.7	58'.5
15	170° 27'.3	12° 01'.1	36'.9	70° 07'.5	45'.4	72° 47'.3	04'.6	316° 48'.1	58'.5
16	185° 29'.8	27° 00'.8	35'.7	85° 08'.2	45'.3	87° 49'.2	04'.6	331° 50'.5	58'.6
17	200° 32'.3	42° 00'.4	34'.5	100° 08'.8	45'.2	102° 51'.1	04'.6	346° 52'.9	58'.6
18	215° 34'.7	57° 00'.1	33'.4	115° 09'.5	45'.1	117° 52'.9	04'.5	1° 55'.3	58'.7
19	230° 37'.2	71° 59'.8	32'.2	130° 10'.1	45'.0	132° 54'.8	04'.5	16° 57'.7	58'.7
20	245° 39'.6	86° 59'.4	31'.0	145° 10'.8	44'.9	147° 56'.7	04'.5	32° 00'.1	58'.7
21	260° 42'.1	101° 59'.1	29'.9	160° 11'.4	44'.8	162° 58'.6	04'.5	47° 02'.5	58'.8
22	275° 44'.6	116° 58'.7	28'.7	175° 12'.1	44'.7	178° 00'.5	04'.4	62° 04'.9	58'.8
23	290° 47'.0	131° 58'.4	27'.5	190° 12'.7	44'.6	193° 02'.3	04'.4	77° 07'.3	58'.8
28 Sunday 00	305° 49'.5	146° 58'.0	10° 26'.4 N	205° 13'.4	23° 44'.5 N	208° 04'.2	23° 04'.4 N	92° 09'.6	10° 58'.9 S
01	320° 52'.0	161° 57'.7	25'.2	220° 14'.0	44'.4	223° 06'.1	04'.4	107° 12'.0	58'.9
02	335° 54'.4	176° 57'.3	24'.0	235° 14'.7	44'.3	238° 08'.0	04'.3	122° 14'.4	58'.9
03	350° 56'.9	191° 57'.0	22'.9	250° 15'.3	44'.2	253° 09'.9	04'.3	137° 16'.8	59'.0
04	5° 59'.4	206° 56'.7	21'.7	265° 16'.0	44'.1	268° 11'.8	04'.3	152° 19'.2	59'.0
05	21° 01'.8	221° 56'.3	20'.5	280° 16'.6	44'.0	283° 13'.6	04'.3	167° 21'.6	59'.1
06	36° 04'.3	236° 56'.0	19'.4	295° 17'.3	43'.9	298° 15'.5	04'.2	182° 24'.0	59'.1
07	51° 06'.8	251° 55'.6	18'.2	310° 17'.9	43'.8	313° 17'.4	04'.2	197° 26'.4	59'.1
08	66° 09'.2	266° 55'.3	17'.0	325° 18'.6	43'.7	328° 19'.3	04'.2	212° 28'.8	59'.2
09	81° 11'.7	281° 55'.0	15'.8	340° 19'.2	43'.6	343° 21'.2	04'.2	227° 31'.2	59'.2
10	96° 14'.1	296° 54'.6	14'.7	355° 19'.9	43'.5	358° 23'.1	04'.1	242° 33'.5	59'.2
11	111° 16'.6	311° 54'.3	13'.5	10° 20'.5	43'.4	13° 24'.9	04'.1	257° 35'.9	59'.3
12	126° 19'.1	326° 54'.0	10° 12'.3 N	25° 21'.2	23° 43'.3 N	28° 26'.8	23° 04'.1 N	272° 38'.3	10° 59'.3 S
13	141° 21'.5	341° 53'.6	11'.2	40° 21'.8	43'.2	43° 28'.7	04'.1	287° 40'.7	59'.4
14	156° 24'.0	356° 53'.3	10'.0	55° 22'.5	43'.1	58° 30'.6	04'.0	302° 43'.1	59'.4
15	171° 26'.5	11° 52'.9	08'.8	70° 23'.1	43'.0	73° 32'.5	04'.0	317° 45'.5	59'.4
16	186° 28'.9	26° 52'.6	07'.6	85° 23'.8	42'.9	88° 34'.4	04'.0	332° 47'.9	59'.5
17	201° 31'.4	41° 52'.3	06'.5	100° 24'.4	42'.8	103° 36'.2	04'.0	347° 50'.3	59'.5
18	216° 33'.9	56° 51'.9	05'.3	115° 25'.1	42'.7	118° 38'.1	03'.9	2° 52'.7	59'.5
19	231° 36'.3	71° 51'.6	04'.1	130° 25'.7	42'.6	133° 40'.0	03'.9	17° 55'.0	59'.6
20	246° 38'.8	86° 51'.3	02'.9	145° 26'.4	42'.5	148° 41'.9	03'.9	32° 57'.4	59'.6
21	261° 41'.3	101° 50'.9	01'.8	160° 27'.0	42'.4	163° 43'.8	03'.9	47° 59'.8	59'.7
22	276° 43'.7	116° 50'.6	00'.6	175° 27'.7	42'.3	178° 45'.7	03'.8	63° 02'.2	59'.7
23	291° 46'.2	131° 50'.3	9° 59'.4 N	190° 28'.3	42'.2	193° 47'.5	03'.8	78° 04'.6	59'.7
29 Monday 00	306° 48'.6	146° 49'.9	9° 58'.2 N	205° 29'.0	23° 42'.1 N	208° 49'.4	23° 03'.8 N	93° 07'.0	10° 59'.8 S
01	321° 51'.1	161° 49'.6	57'.0	220° 29'.6	42'.0	223° 51'.3	03'.7	108° 09'.4	59'.8
02	336° 53'.6	176° 49'.3	55'.9	235° 30'.3	41'.9	238° 53'.2	03'.7	123° 11'.8	59'.8
03	351° 56'.0	191° 48'.9	54'.7	250° 31'.0	41'.8	253° 55'.1	03'.7	138° 14'.1	59'.9
04	6° 58'.5	206° 48'.6	53'.5	265° 31'.6	41'.7	268° 57'.0	03'.7	153° 16'.5	59'.9
05	22° 01'.0	221° 48'.3	52'.3	280° 32'.3	41'.6	283° 58'.8	03'.6	168° 18'.9	11° 00'.0 S
06	37° 03'.4	236° 47'.9	51'.1	295° 32'.9	41'.5	299° 00'.7	03'.6	183° 21'.3	00'.0
07	52° 05'.9	251° 47'.6	50'.0	310° 33'.6	41'.4	314° 02'.6	03'.6	198° 23'.7	00'.0
08	67° 08'.4	266° 47'.3	48'.8	325° 34'.2	41'.2	329° 04'.5	03'.6	213° 26'.1	00'.1
09	82° 10'.8	281° 47'.0	47'.6	340° 34'.9	41'.1	344° 06'.4	03'.5	228° 28'.5	00'.1
10	97° 13'.3	296° 46'.6	46'.4	355° 35'.5	41'.0	359° 08'.3	03'.5	243° 30'.9	00'.2
11	112° 15'.7	311° 46'.3	45'.2	10° 36'.2	40'.9	14° 10'.2	03'.5	258° 33'.2	00'.2
12	127° 18'.2	326° 46'.0	9° 44'.1 N	25° 36'.8	23° 40'.8 N	29° 12'.0	23° 03'.5 N	273° 35'.6	11° 00'.2 S
13	142° 20'.7	341° 45'.6	42'.9	40° 37'.5	40'.7	44° 13'.9	03'.4	288° 38'.0	00'.3
14	157° 23'.1	356° 45'.3	41'.7	55° 38'.1	40'.6	59° 15'.8	03'.4	303° 40'.4	00'.3
15	172° 25'.6	11° 45'.0	40'.5	70° 38'.8	40'.5	74° 17'.7	03'.4	318° 42'.8	00'.4
16	187° 28'.1	26° 44'.7	39'.3	85° 39'.5	40'.4	89° 19'.6	03'.4	333° 45'.2	00'.4
17	202° 30'.5	41° 44'.3	38'.1	100° 40'.1	40'.3	104° 21'.5	03'.3	348° 47'.5	00'.4
18	217° 33'.0	56° 44'.0	37'.0	115° 40'.8	40'.2	119° 23'.4	03'.3	3° 49'.9	00'.5
19	232° 35'.5	71° 43'.7	35'.8	130° 41'.4	40'.0	134° 25'.2	03'.3	18° 52'.3	00'.5
20	247° 37'.9	86° 43'.4	34'.6	145° 42'.1	39'.9	149° 27'.1	03'.2	33° 54'.7	00'.5
21	262° 40'.4	101° 43'.0	33'.4	160° 42'.7	39'.8	164° 29'.0	03'.2	48° 57'.1	00'.6
22	277° 42'.9	116° 42'.7	32'.2	175° 43'.4	39'.7	179° 30'.9	03'.2	63° 59'.5	00'.6
23	292° 45'.3	131° 42'.4	31'.0	190° 44'.0	39'.6	194° 32'.8	03'.2	79° 01'.9	00'.7
	M.P. 03:32	v -0'.3	d 1'.2	v 0'.7	d 0'.1	v 1'.9	d 0'.0	v 2'.4	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.4	40° 14'.8 S
Achernar	335° 26'.7	57° 09'.7 S
Acrux	173° 09'.4	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.5 S
Aldebaran	290° 49'.4	16° 32'.1 N
Alioth	166° 20'.9	55° 53'.4 N
Alkaid	152° 58'.9	49° 15'.0 N
Alnair	27° 43'.2	46° 53'.4 S
Alnilam	275° 46'.5	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.8	26° 40'.4 N
Alpheratz	357° 43'.2	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.4	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.9 N
Atria	107° 27'.2	69° 03'.2 S
Avior	234° 18'.6	59° 33'.3 S
Bellatrix	278° 32'.1	6° 21'.6 N
Betelgeuse	271° 01'.5	7° 24'.5 N
Canopus	263° 56'.6	52° 42'.2 S
Capella	280° 34'.6	46° 00'.4 N
Deneb	49° 30'.9	45° 19'.9 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.7	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.8 N
Elnath	278° 12'.8	28° 36'.9 N
Eltanin	90° 45'.7	51° 29'.6 N
Enif	33° 46'.7	9° 56'.5 N
Fomalhaut	15° 23'.6	29° 32'.7 S
Gacrux	172° 01'.0	57° 11'.6 S
Gienah	175° 52'.3	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.5 S
Hamal	328° 00'.6	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 19'.9	74° 06'.3 N
Markab	13° 38'.0	15° 16'.8 N
Menkar	314° 15'.0	4° 08'.6 N
Menkent	148° 07'.4	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.6 S
Mirfak	308° 40'.3	49° 54'.3 N
Nunki	75° 57'.8	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.2 S
Polaris	317° 47'.0	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.5 N
Procyon	244° 59'.9	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.2	8° 11'.2 S
Rigil Kent	139° 51'.4	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.1	56° 36'.6 N
Shaula	96° 21'.4	37° 06'.7 S
Sirius	258° 33'.9	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.4 S
Vega	80° 38'.5	38° 48'.1 N
Zuben'ubi	137° 05'.2	16° 05'.8 S

	SHA	Mer.Pass.
Venus	201° 08'.5	14:12
Mars	259° 23'.9	10:19
Jupiter	262° 14'.7	10:06
Saturn	146° 20'.1	17:49

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
27 00	178° 22'.4	19° 13'.1 N	304° 52'.2	11'.6	3° 38'.3 N	11'.4	57'.9
01	193° 22'.4	12'.6	319° 22'.8	11'.6	49'.7	11'.4	
02	208° 22'.4	12'.0	333° 53'.4	11'.7	4° 01'.1 N	11'.3	57'.8
03	223° 22'.4	11'.4	348° 24'.1	11'.7	12'.4	11'.3	
04	238° 22'.4	10'.9	2° 54'.8	11'.7	23'.7	11'.2	57'.7
05	253° 22'.4	10'.3	17° 25'.5	11'.8	34'.9	11'.2	
06	268° 22'.5	09'.7	31° 56'.3	11'.7	46'.1	11'.1	
07	283° 22'.5	09'.2	46° 27'.0	11'.8	57'.2	11'.2	57'.6
08	298° 22'.5	08'.6	60° 57'.8	11'.9	5° 08'.4 N	11'.0	
09	313° 22'.5	08'.0	75° 28'.7	11'.8	19'.4	11'.1	57'.5
10	328° 22'.5	07'.5	89° 59'.5	11'.9	30'.5	10'.9	
11	343° 22'.5	06'.9	104° 30'.4	11'.9	41'.4	11'.0	
12	358° 22'.5	19° 06'.3 N	119° 01'.3	11'.9	5° 52'.4 N	10'.9	57'.4
13	13° 22'.5	05'.7	133° 32'.2	12'.0	6° 03'.3 N	10'.8	
14	28° 22'.5	05'.2	148° 03'.2	12'.0	14'.1	10'.8	
15	43° 22'.5	04'.6	162° 34'.2	12'.0	24'.9	10'.8	57'.3
16	58° 22'.5	04'.0	177° 05'.2	12'.0	35'.7	10'.7	
17	73° 22'.6	03'.5	191° 36'.2	12'.0	46'.4	10'.6	57'.2
18	88° 22'.6	02'.9	206° 07'.2	12'.1	57'.0	10'.7	
19	103° 22'.6	02'.3	220° 38'.3	12'.0	7° 07'.7 N	10'.5	
20	118° 22'.6	01'.7	235° 09'.3	12'.1	18'.2	10'.5	57'.1
21	133° 22'.6	01'.2	249° 40'.4	12'.2	28'.7	10'.5	
22	148° 22'.6	00'.6	264° 11'.6	12'.1	39'.2	10'.4	57'.0
23	163° 22'.6	00'.0	278° 42'.7	12'.1	49'.6	10'.3	
28 00	178° 22'.6	18° 59'.4 N	293° 13'.8	12'.2	7° 59'.9 N	10'.3	57'.0
01	193° 22'.7	58'.8	307° 45'.0	12'.2	8° 10'.2 N	10'.3	56'.9
02	208° 22'.7	58'.3	322° 16'.2	12'.2	20'.5	10'.2	
03	223° 22'.7	57'.7	336° 47'.4	12'.2	30'.7	10'.1	
04	238° 22'.7	57'.1	351° 18'.6	12'.2	40'.8	10'.1	56'.8
05	253° 22'.7	56'.5	5° 49'.8	12'.2	50'.9	10'.0	
06	268° 22'.7	55'.9	20° 21'.0	12'.3	9° 00'.9 N	10'.0	
07	283° 22'.7	55'.4	34° 52'.3	12'.3	10'.9	9'.9	56'.7
08	298° 22'.8	54'.8	49° 23'.6	12'.2	20'.8	9'.8	
09	313° 22'.8	54'.2	63° 54'.8	12'.3	30'.6	9'.8	56'.6
10	328° 22'.8	53'.6	78° 26'.1	12'.3	40'.4	9'.7	
11	343° 22'.8	53'.0	92° 57'.4	12'.3	50'.1	9'.7	
12	358° 22'.8	18° 52'.5 N	107° 28'.7	12'.3	9° 59'.8 N	9'.6	56'.5
13	13° 22'.8	51'.9	122° 00'.0	12'.3	10° 09'.4 N	9'.5	
14	28° 22'.8	51'.3	136° 31'.3	12'.4	18'.9	9'.5	
15	43° 22'.9	50'.7	151° 02'.7	12'.3	28'.4	9'.5	56'.4
16	58° 22'.9	50'.1	165° 34'.0	12'.4	37'.9	9'.3	
17	73° 22'.9	49'.5	180° 05'.4	12'.3	47'.2	9'.3	
18	88° 22'.9	48'.9	194° 36'.7	12'.4	56'.5	9'.2	56'.3
19	103° 22'.9	48'.3	209° 08'.1	12'.3	11° 05'.7 N	9'.2	
20	118° 22'.9	47'.8	223° 39'.4	12'.4	14'.9	9'.1	
21	133° 23'.0	47'.2	238° 10'.8	12'.4	24'.0	9'.0	56'.2
22	148° 23'.0	46'.6	252° 42'.2	12'.4	33'.0	9'.0	
23	163° 23'.0	46'.0	267° 13'.6	12'.3	42'.0	8'.9	
29 00	178° 23'.0	18° 45'.4 N	281° 44'.9	12'.4	11° 50'.9 N	8'.8	56'.1
01	193° 23'.0	44'.8	296° 16'.3	12'.4	59'.7	8'.8	
02	208° 23'.1	44'.2	310° 47'.7	12'.4	12° 08'.5 N	8'.7	
03	223° 23'.1	43'.6	325° 19'.1	12'.4	17'.2	8'.6	56'.0
04	238° 23'.1	43'.0	339° 50'.5	12'.4	25'.8	8'.6	
05	253° 23'.1	42'.4	354° 21'.9	12'.4	34'.4	8'.5	
06	268° 23'.1	41'.8	8° 53'.3	12'.4	42'.9	8'.4	55'.9
07	283° 23'.2	41'.3	23° 24'.7	12'.4	51'.3	8'.4	
08	298° 23'.2	40'.7	37° 56'.1	12'.4	59'.7	8'.3	
09	313° 23'.2	40'.1	52° 27'.5	12'.4	13° 08'.0 N	8'.2	55'.8
10	328° 23'.2	39'.5	66° 58'.9	12'.4	16'.2	8'.1	
11	343° 23'.2	38'.9	81° 30'.3	12'.4	24'.3	8'.1	
12	358° 23'.3	18° 38'.3 N	96° 01'.7	12'.4	13° 32'.4 N	8'.0	55'.7
13	13° 23'.3	37'.7	110° 33'.1	12'.4	40'.4	7'.9	
14	28° 23'.3	37'.1	125° 04'.5	12'.4	48'.3	7'.8	
15	43° 23'.3	36'.5	139° 35'.9	12'.4	56'.1	7'.8	
16	58° 23'.4	35'.9	154° 07'.3	12'.4	14° 03'.9 N	7'.7	55'.6
17	73° 23'.4	35'.3	168° 38'.7	12'.3	11'.6	7'.6	
18	88° 23'.4	34'.7	183° 10'.0	12'.4	19'.2	7'.6	
19	103° 23'.4	34'.1	197° 41'.4	12'.4	26'.8	7'.4	55'.5
20	118° 23'.4	33'.5	212° 12'.8	12'.4	34'.2	7'.4	
21	133° 23'.5	32'.9	226° 44'.2	12'.4	41'.6	7'.4	
22	148° 23'.5	32'.3	241° 15'.6	12'.3	49'.0	7'.2	
23	163° 23'.5	31'.7	255° 46'.9	12'.4	56'.2	7'.2	55'.4
	SD 15'.8	d 0'.6	SD	15'.6	15'.4	15'.2	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29
N 72°	-	-	-	20:48	20:36	20:21
N 70°	-	-	00:39	20:58	20:54	20:51
68°	-	-	01:54	21:07	21:09	21:13
66°	-	-	02:30	21:14	21:21	21:30
64°	-	01:14	02:56	21:20	21:31	21:45
62°	-	01:59	03:15	21:25	21:40	21:57
60°	-	02:28	03:32	21:30	21:47	22:07
N 58°	01:07	02:49	03:45	21:34	21:54	22:16
56°	01:48	03:07	03:57	21:38	22:00	22:24
54°	02:15	03:21	04:07	21:41	22:05	22:31
52°	02:35	03:33	04:16	21:44	22:09	22:37
50°	02:52	03:44	04:24	21:47	22:14	22:43
45°	03:23	04:07	04:41	21:53	22:23	22:56
N 40°	03:46	04:24	04:55	21:58	22:31	23:06
35°	04:04	04:38	05:06	22:02	22:38	23:15
30°	04:19	04:50	05:17	22:06	22:44	23:23
20°	04:42	05:10	05:34	22:13	22:54	23:36
N 10°	05:01	05:27	05:49	22:19	23:03	23:48
0°	05:16	05:41	06:03	22:25	23:12	23:59
S 10°	05:29	05:55	06:17	22:30	23:21	24:10
20°	05:41	06:08	06:31	22:36	23:30	24:23
30°	05:54	06:23	06:48	22:43	23:41	24:36
35°	06:00	06:31	06:58	22:47	23:47	24:44
40°	06:07	06:39	07:09	22:52	23:54	24:54
45°	06:14	06:49	07:21	22:57	-	00:02
S 50°	06:22	07:01	07:37	23:04	-	00:12
52°	06:25	07:07	07:44	23:07	-	00:17
54°	06:29	07:12	07:52	23:10	-	00:22
56°	06:33	07:19	08:01	23:14	-	00:28
58°	06:37	07:26	08:12	23:18	-	00:34
S 60°	06:42	07:34	08:23	23:22	-	00:41
S 62°	06:47	07:43	08:37	23:28	-	00:50

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 27	Moonset 28	Moonset 29
N 72°	-	-	-	11:13	13:04	14:58
N 70°	23:19	-	-	11:04	12:47	14:30
68°	22:14	-	-	10:57	12:34	14:09
66°	21:40	-	-	10:52	12:23	13:52
64°	21:15	22:53	-	10:47	12:14	13:38
62°	20:56	22:10	-	10:43	12:07	13:27
60°	20:40	21:43	-	10:40	12:00	13:17
N 58°	20:26	21:22	23:00	10:36	11:54	13:09
56°	20:15	21:05	22:21	10:34	11:49	13:02
54°	20:05	20:50	21:56	10:31	11:45	12:55
52°	19:56	20:38	21:36	10:29	11:41	12:49
50°	19:48	20:28	21:20	10:27	11:37	12:44
45°	19:31	20:06	20:49	10:22	11:29	12:32
N 40°	19:18	19:48	20:26	10:19	11:22	12:23
35°	19:06	19:34	20:08	10:16	11:16	12:15
30°	18:56	19:22	19:53	10:13	11:11	12:08
20°	18:39	19:02	19:30	10:08	11:02	11:55
N 10°	18:24	18:46	19:12	10:04	10:55	11:45
0°	18:10	18:32	18:57	09:59	10:47	11:35
S 10°	17:56	18:18	18:44	09:55	10:40	11:25
20°	17:42	18:05	18:32	09:51	10:32	11:14
30°	17:25	17:51	18:20	09:46	10:24	11:02
35°	17:16	17:43	18:13	09:44	10:19	10:55
40°	17:05	17:34	18:07	09:40	10:13	10:47
45°	16:52	17:24	18:00	09:37	10:06	10:38
S 50°	16:37	17:12	17:52	09:32	09:59	10:27
52°	16:29	17:07	17:48	09:30	09:55	10:21
54°	16:21	17:01	17:45	09:28	09:51	10:16
56°	16:12	16:55	17:41	09:26	09:47	10:10
58°	16:02	16:48	17:36	09:23	09:42	10:02
S 60°	15:50	16:40	17:32	09:20	09:36	09:55
S 62°	15:36	16:31	17:27	09:17	09:30	09:46

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
27	6 30	6 30	12:06	03:48	16:12	19d 72%
28	6 29	6 29	12:06	04:36	17:00	20d 63%
29	6 28	6 27	12:06	05:23	17:47	21d 53%

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2013 Jul 30, 31, Aug. 1 (Tue, Wed, Thur)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
30 Tuesday 00	307° 47'.8	146° 42'.1	9° 29'.8 N	205° 44'.7	23° 39'.5 N	209° 34'.7	23° 03'.1 N	94° 04'.2	11° 00'.7 S
01	322° 50'.2	161° 41'.7	28'.6	220° 45'.4	39'.4	224° 36'.6	03'.1	109° 06'.6	00'.7
02	337° 52'.7	176° 41'.4	27'.5	235° 46'.0	39'.3	239° 38'.4	03'.1	124° 09'.0	00'.8
03	352° 55'.2	191° 41'.1	26'.3	250° 46'.7	39'.1	254° 40'.3	03'.1	139° 11'.4	00'.8
04	7° 57'.6	206° 40'.8	25'.1	265° 47'.3	39'.0	269° 42'.2	03'.0	154° 13'.8	00'.9
05	23° 00'.1	221° 40'.5	23'.9	280° 48'.0	38'.9	284° 44'.1	03'.0	169° 16'.2	00'.9
06	38° 02'.6	236° 40'.1	22'.7	295° 48'.6	38'.8	299° 46'.0	03'.0	184° 18'.5	00'.9
07	53° 05'.0	251° 39'.8	21'.5	310° 49'.3	38'.7	314° 47'.9	03'.0	199° 20'.9	01'.0
08	68° 07'.5	266° 39'.5	20'.3	325° 49'.9	38'.6	329° 49'.8	02'.9	214° 23'.3	01'.0
09	83° 10'.0	281° 39'.2	19'.1	340° 50'.6	38'.4	344° 51'.7	02'.9	229° 25'.7	01'.1
10	98° 12'.4	296° 38'.9	17'.9	355° 51'.3	38'.3	359° 53'.5	02'.9	244° 28'.1	01'.1
11	113° 14'.9	311° 38'.5	16'.7	10° 51'.9	38'.2	14° 55'.4	02'.8	259° 30'.4	01'.1
12	128° 17'.4	326° 38'.2	9° 15'.5 N	25° 52'.6	23° 38'.1 N	29° 57'.3	23° 02'.8 N	274° 32'.8	11° 01'.2 S
13	143° 19'.8	341° 37'.9	14'.3	40° 53'.2	38'.0	44° 59'.2	02'.8	289° 35'.2	01'.2
14	158° 22'.3	356° 37'.6	13'.2	55° 53'.9	37'.9	60° 01'.1	02'.8	304° 37'.6	01'.3
15	173° 24'.7	11° 37'.3	12'.0	70° 54'.5	37'.7	75° 03'.0	02'.7	319° 40'.0	01'.3
16	188° 27'.2	26° 37'.0	10'.8	85° 55'.2	37'.6	90° 04'.9	02'.7	334° 42'.3	01'.3
17	203° 29'.7	41° 36'.6	09'.6	100° 55'.9	37'.5	105° 06'.8	02'.7	349° 44'.7	01'.4
18	218° 32'.1	56° 36'.3	08'.4	115° 56'.5	37'.4	120° 08'.6	02'.7	4° 47'.1	01'.4
19	233° 34'.6	71° 36'.0	07'.2	130° 57'.2	37'.3	135° 10'.5	02'.6	19° 49'.5	01'.5
20	248° 37'.1	86° 35'.7	06'.0	145° 57'.8	37'.1	150° 12'.4	02'.6	34° 51'.9	01'.5
21	263° 39'.5	101° 35'.4	04'.8	160° 58'.5	37'.0	165° 14'.3	02'.6	49° 54'.3	01'.5
22	278° 42'.0	116° 35'.1	03'.6	175° 59'.2	36'.9	180° 16'.2	02'.5	64° 56'.6	01'.6
23	293° 44'.5	131° 34'.8	02'.4	190° 59'.8	36'.8	195° 18'.1	02'.5	79° 59'.0	01'.6
31 Wednesday 00	308° 46'.9	146° 34'.4	9° 01'.2 N	206° 00'.5	23° 36'.7 N	210° 20'.0	23° 02'.5 N	95° 01'.4	11° 01'.7 S
01	323° 49'.4	161° 34'.1	00'.0	221° 01'.1	36'.5	225° 21'.9	02'.5	110° 03'.8	01'.7
02	338° 51'.8	176° 33'.8	8° 58'.8 N	236° 01'.8	36'.4	240° 23'.8	02'.4	125° 06'.2	01'.7
03	353° 54'.3	191° 33'.5	57'.6	251° 02'.5	36'.3	255° 25'.6	02'.4	140° 08'.5	01'.8
04	8° 56'.8	206° 33'.2	56'.4	266° 03'.1	36'.2	270° 27'.5	02'.4	155° 10'.9	01'.8
05	23° 59'.2	221° 32'.9	55'.2	281° 03'.8	36'.0	285° 29'.4	02'.4	170° 13'.3	01'.9
06	39° 01'.7	236° 32'.6	54'.0	296° 04'.4	35'.9	300° 31'.3	02'.3	185° 15'.7	01'.9
07	54° 04'.2	251° 32'.3	52'.8	311° 05'.1	35'.8	315° 33'.2	02'.3	200° 18'.0	01'.9
08	69° 06'.6	266° 32'.0	51'.6	326° 05'.8	35'.7	330° 35'.1	02'.3	215° 20'.4	02'.0
09	84° 09'.1	281° 31'.6	50'.4	341° 06'.4	35'.6	345° 37'.0	02'.2	230° 22'.8	02'.0
10	99° 11'.6	296° 31'.3	49'.2	356° 07'.1	35'.4	0° 38'.9	02'.2	245° 25'.2	02'.1
11	114° 14'.0	311° 31'.0	48'.0	11° 07'.7	35'.3	15° 40'.8	02'.2	260° 27'.6	02'.1
12	129° 16'.5	326° 30'.7	8° 46'.8 N	26° 08'.4	23° 35'.2 N	30° 42'.7	23° 02'.2 N	275° 29'.9	11° 02'.2 S
13	144° 19'.0	341° 30'.4	45'.6	41° 09'.1	35'.1	45° 44'.5	02'.1	290° 32'.3	02'.2
14	159° 21'.4	356° 30'.1	44'.4	56° 09'.7	34'.9	60° 46'.4	02'.1	305° 34'.7	02'.2
15	174° 23'.9	11° 29'.8	43'.2	71° 10'.4	34'.8	75° 48'.3	02'.1	320° 37'.1	02'.3
16	189° 26'.3	26° 29'.5	42'.0	86° 11'.0	34'.7	90° 50'.2	02'.0	335° 39'.4	02'.3
17	204° 28'.8	41° 29'.2	40'.8	101° 11'.7	34'.5	105° 52'.1	02'.0	350° 41'.8	02'.4
18	219° 31'.3	56° 28'.9	39'.6	116° 12'.4	34'.4	120° 54'.0	02'.0	5° 44'.2	02'.4
19	234° 33'.7	71° 28'.6	38'.4	131° 13'.0	34'.3	135° 55'.9	02'.0	20° 46'.6	02'.4
20	249° 36'.2	86° 28'.3	37'.2	146° 13'.7	34'.2	150° 57'.8	01'.9	35° 49'.0	02'.5
21	264° 38'.7	101° 28'.0	36'.0	161° 14'.4	34'.0	165° 59'.7	01'.9	50° 51'.3	02'.5
22	279° 41'.1	116° 27'.7	34'.8	176° 15'.0	33'.9	181° 01'.6	01'.9	65° 53'.7	02'.6
23	294° 43'.6	131° 27'.4	33'.5	191° 15'.7	33'.8	196° 03'.5	01'.9	80° 56'.1	02'.6
1 Thursday 00	309° 46'.1	146° 27'.0	8° 32'.3 N	206° 16'.3	23° 33'.7 N	211° 05'.3	23° 01'.8 N	95° 58'.5	11° 02'.7 S
01	324° 48'.5	161° 26'.7	31'.1	221° 17'.0	33'.5	226° 07'.2	01'.8	111° 00'.8	02'.7
02	339° 51'.0	176° 26'.4	29'.9	236° 17'.7	33'.4	241° 09'.1	01'.8	126° 03'.2	02'.7
03	354° 53'.5	191° 26'.1	28'.7	251° 18'.3	33'.3	256° 11'.0	01'.7	141° 05'.6	02'.8
04	9° 55'.9	206° 25'.8	27'.5	266° 19'.0	33'.1	271° 12'.9	01'.7	156° 08'.0	02'.8
05	24° 58'.4	221° 25'.5	26'.3	281° 19'.7	33'.0	286° 14'.8	01'.7	171° 10'.3	02'.9
06	40° 00'.8	236° 25'.2	25'.1	296° 20'.3	32'.9	301° 16'.7	01'.7	186° 12'.7	02'.9
07	55° 03'.3	251° 24'.9	23'.9	311° 21'.0	32'.7	316° 18'.6	01'.6	201° 15'.1	02'.9
08	70° 05'.8	266° 24'.6	22'.7	326° 21'.6	32'.6	331° 20'.5	01'.6	216° 17'.5	03'.0
09	85° 08'.2	281° 24'.3	21'.5	341° 22'.3	32'.5	346° 22'.4	01'.6	231° 19'.8	03'.0
10	100° 10'.7	296° 24'.0	20'.3	356° 23'.0	32'.3	1° 24'.3	01'.5	246° 22'.2	03'.1
11	115° 13'.2	311° 23'.7	19'.0	11° 23'.6	32'.2	16° 26'.2	01'.5	261° 24'.6	03'.1
12	130° 15'.6	326° 23'.4	8° 17'.8 N	26° 24'.3	23° 32'.1 N	31° 28'.0	23° 01'.5 N	276° 27'.0	11° 03'.2 S
13	145° 18'.1	341° 23'.1	16'.6	41° 25'.0	31'.9	46° 29'.9	01'.5	291° 29'.3	03'.2
14	160° 20'.6	356° 22'.8	15'.4	56° 25'.6	31'.8	61° 31'.8	01'.4	306° 31'.7	03'.2
15	175° 23'.0	11° 22'.5	14'.2	71° 26'.3	31'.7	76° 33'.7	01'.4	321° 34'.1	03'.3
16	190° 25'.5	26° 22'.2	13'.0	86° 27'.0	31'.5	91° 35'.6	01'.4	336° 36'.5	03'.3
17	205° 28'.0	41° 21'.9	11'.8	101° 27'.6	31'.4	106° 37'.5	01'.3	351° 38'.8	03'.4
18	220° 30'.4	56° 21'.6	10'.6	116° 28'.3	31'.3	121° 39'.4	01'.3	6° 41'.2	03'.4
19	235° 32'.9	71° 21'.3	09'.3	131° 29'.0	31'.1	136° 41'.3	01'.3	21° 43'.6	03'.5
20	250° 35'.3	86° 21'.0	08'.1	146° 29'.6	31'.0	151° 43'.2	01'.3	36° 45'.9	03'.5
21	265° 37'.8	101° 20'.8	06'.9	161° 30'.3	30'.9	166° 45'.1	01'.2	51° 48'.3	03'.5
22	280° 40'.3	116° 20'.5	05'.7	176° 31'.0	30'.7	181° 47'.0	01'.2	66° 50'.7	03'.6
23	295° 42'.7	131° 20'.2	04'.5	191° 31'.6	30'.6	196° 48'.9	01'.2	81° 53'.1	03'.6
	M.P. 03:20	v -0'.3	d 1'.2	v 0'.7	d 0'.1	v 1'.9	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.3	40° 14'.8 S
Achernar	335° 26'.6	57° 09'.7 S
Acrux	173° 09'.5	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.5 S
Aldebaran	290° 49'.4	16° 32'.1 N
Alioth	166° 20'.9	55° 53'.4 N
Alkaid	152° 58'.9	49° 15'.0 N
Alnair	27° 43'.2	46° 53'.4 S
Alnilam	275° 46'.5	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.2 S
Alphecca	126° 10'.8	26° 40'.4 N
Alpheratz	357° 43'.1	29° 09'.9 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.4	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.9 N
Atria	107° 27'.3	69° 03'.2 S
Avior	234° 18'.6	59° 33'.3 S
Bellatrix	278° 32'.1	6° 21'.6 N
Betelgeuse	271° 01'.4	7° 24'.5 N
Canopus	263° 56'.6	52° 42'.2 S
Capella	280° 34'.6	46° 00'.4 N
Deneb	49° 30'.9	45° 19'.9 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.6	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.8 N
Elnath	278° 12'.7	28° 36'.9 N
Eltanin	90° 45'.7	51° 29'.6 N
Enif	33° 46'.7	9° 56'.5 N
Fomalhaut	15° 23'.6	29° 32'.7 S
Gacrux	172° 01'.0	57° 11'.6 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.5 S
Hamal	328° 00'.6	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 20'.0	74° 06'.3 N
Markab	13° 37'.9	15° 16'.8 N
Menkar	314° 15'.0	4° 08'.6 N
Menkent	148° 07'.4	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.6 S
Mirfak	308° 40'.3	49° 54'.3 N
Nunki	75° 57'.8	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.2 S
Polaris	317° 45'.5	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.4 N
Procyon	244° 59'.9	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.2	8° 11'.2 S
Rigil Kent	139° 51'.4	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.1	56° 36'.6 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 33'.9	16° 44'.1 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.4 S
Vega	80° 38'.5	38° 48'.1 N
Zuben'ubi	137° 05'.2	16° 05'.8 S

	SHA	Mer.Pass.
Venus	197° 47'.5	14:14
Mars	257° 13'.6	10:16
Jupiter	261° 33'.1	09:57
Saturn	146° 14'.5	17:37

SUN	GHA	Dec
30 00	178° 23'.5	18° 31'.1 N
01	193° 23'.6	30'.5
02	208° 23'.6	29'.9
03	223° 23'.6	29'.3
04	238° 23'.6	28'.6
05	253° 23'.7	28'.0
06	268° 23'.7	27'.4
07	283° 23'.7	26'.8
08	298° 23'.7	26'.2
09	313° 23'.8	25'.6
10	328° 23'.8	25'.0
11	343° 23'.8	24'.4
12	358° 23'.9	18° 23'.8 N
13	13° 23'.9	23'.2
14	28° 23'.9	22'.6
15	43° 23'.9	22'.0
16	58° 24'.0	21'.3
17	73° 24'.0	20'.7
18	88° 24'.0	20'.1
19	103° 24'.1	19'.5
20	118° 24'.1	18'.9
21	133° 24'.1	18'.3
22	148° 24'.2	17'.7
23	163° 24'.2	17'.0
31 00	178° 24'.2	18° 16'.4 N
01	193° 24'.2	15'.8
02	208° 24'.3	15'.2
03	223° 24'.3	14'.6
04	238° 24'.3	14'.0
05	253° 24'.4	13'.3
06	268° 24'.4	12'.7
07	283° 24'.4	12'.1
08	298° 24'.5	11'.5
09	313° 24'.5	10'.9
10	328° 24'.5	10'.2
11	343° 24'.6	09'.6
12	358° 24'.6	18° 09'.0 N
13	13° 24'.6	08'.4
14	28° 24'.7	07'.8
15	43° 24'.7	07'.1
16	58° 24'.7	06'.5
17	73° 24'.8	05'.9
18	88° 24'.8	05'.3
19	103° 24'.8	04'.6
20	118° 24'.9	04'.0
21	133° 24'.9	03'.4
22	148° 25'.0	02'.7
23	163° 25'.0	02'.1
1 00	178° 25'.0	18° 01'.5 N
01	193° 25'.1	00'.9
02	208° 25'.1	00'.2
03	223° 25'.1	17° 59'.6 N
04	238° 25'.2	59'.0
05	253° 25'.2	58'.3
06	268° 25'.3	57'.7
07	283° 25'.3	57'.1
08	298° 25'.3	56'.4
09	313° 25'.4	55'.8
10	328° 25'.4	55'.2
11	343° 25'.5	54'.5
12	358° 25'.5	17° 53'.9 N
13	13° 25'.5	53'.3
14	28° 25'.6	52'.6
15	43° 25'.6	52'.0
16	58° 25'.7	51'.4
17	73° 25'.7	50'.7
18	88° 25'.7	50'.1
19	103° 25'.8	49'.5
20	118° 25'.8	48'.8
21	133° 25'.9	48'.2
22	148° 25'.9	47'.5
23	163° 26'.0	46'.9
	SD 15'.8	d 0'.6

MOON	GHA	v	Dec	d	HP
30 00	270° 18'.3	12'.4	15° 03'.4 N	7'.1	55'.4
01	284° 49'.7	12'.3	10'.5	7'.0	
02	299° 21'.0	12'.4	17'.5	6'.9	
03	313° 52'.4	12'.3	24'.4	6'.9	55'.3
04	328° 23'.7	12'.3	31'.3	6'.7	
05	342° 55'.0	12'.4	38'.0	6'.7	
06	357° 26'.4	12'.3	44'.7	6'.7	55'.2
07	11° 57'.7	12'.3	51'.4	6'.5	
08	26° 29'.0	12'.4	57'.9	6'.4	
09	41° 00'.4	12'.3	16° 04'.3 N	6'.4	
10	55° 31'.7	12'.3	10'.7	6'.3	55'.1
11	70° 03'.0	12'.3	17'.0	6'.2	
12	84° 34'.3	12'.3	16° 23'.2 N	6'.2	55'.1
13	99° 05'.6	12'.2	29'.4	6'.0	
14	113° 36'.8	12'.3	35'.4	6'.0	
15	128° 08'.1	12'.3	41'.4	5'.9	55'.0
16	142° 39'.4	12'.3	47'.3	5'.8	
17	157° 10'.7	12'.2	53'.1	5'.7	
18	171° 41'.9	12'.3	58'.8	5'.6	
19	186° 13'.2	12'.2	17° 04'.4 N	5'.6	54'.9
20	200° 44'.4	12'.2	10'.0	5'.4	
21	215° 15'.6	12'.3	15'.4	5'.4	
22	229° 46'.9	12'.2	20'.8	5'.3	
23	244° 18'.1	12'.2	26'.1	5'.2	
31 00	258° 49'.3	12'.2	17° 31'.3 N	5'.2	54'.8
01	273° 20'.5	12'.2	36'.5	5'.0	
02	287° 51'.7	12'.2	41'.5	5'.0	
03	302° 22'.9	12'.2	46'.5	4'.8	
04	316° 54'.1	12'.2	51'.3	4'.8	
05	331° 25'.3	12'.1	56'.1	4'.7	54'.7
06	345° 56'.4	12'.2	18° 00'.8 N	4'.6	
07	0° 27'.6	12'.2	05'.4	4'.6	
08	14° 58'.8	12'.1	10'.0	4'.4	
09	29° 29'.9	12'.1	14'.4	4'.4	
10	44° 01'.0	12'.2	18'.8	4'.2	54'.6
11	58° 32'.2	12'.1	23'.0	4'.2	
12	73° 03'.3	12'.1	18° 27'.2 N	4'.1	54'.6
13	87° 34'.4	12'.1	31'.3	4'.0	
14	102° 05'.5	12'.1	35'.3	3'.9	
15	116° 36'.6	12'.1	39'.2	3'.8	
16	131° 07'.7	12'.1	43'.0	3'.7	54'.5
17	145° 38'.8	12'.1	46'.7	3'.7	
18	160° 09'.9	12'.1	50'.4	3'.5	
19	174° 41'.0	12'.1	53'.9	3'.5	
20	189° 12'.1	12'.0	57'.4	3'.4	
21	203° 43'.1	12'.1	19° 00'.8 N	3'.3	
22	218° 14'.2	12'.1	04'.1	3'.2	54'.4
23	232° 45'.3	12'.0	07'.3	3'.1	
1 00	247° 16'.3	12'.1	19° 10'.4 N	3'.0	54'.4
01	261° 47'.4	12'.0	13'.4	2'.9	
02	276° 18'.4	12'.0	16'.3	2'.9	
03	290° 49'.4	12'.1	19'.2	2'.7	
04	305° 20'.5	12'.0	21'.9	2'.7	
05	319° 51'.5	12'.0	24'.6	2'.5	54'.3
06	334° 22'.5	12'.0	27'.1	2'.5	
07	348° 53'.5	12'.1	29'.6	2'.4	
08	3° 24'.6	12'.0	32'.0	2'.3	
09	17° 55'.6	12'.0	34'.3	2'.2	
10	32° 26'.6	12'.0	36'.5	2'.1	
11	46° 57'.6	12'.0	38'.6	2'.0	
12	61° 28'.6	12'.0	19° 40'.6 N	1'.9	54'.3
13	75° 59'.6	12'.0	42'.5	1'.8	
14	90° 30'.6	12'.0	44'.3	1'.8	54'.2
15	105° 01'.6	12'.0	46'.1	1'.6	
16	119° 32'.6	12'.0	47'.7	1'.6	
17	134° 03'.6	11'.9	49'.3	1'.4	
18	148° 34'.5	12'.0	50'.7	1'.4	
19	163° 05'.5	12'.0	52'.1	1'.3	
20	177° 36'.5	12'.0	53'.4	1'.2	
21	192° 07'.5	12'.0	54'.6	1'.1	
22	206° 38'.5	12'.0	55'.7	1'.0	
23	221° 09'.5	12'.0	56'.7	0'.9	
	SD 15'.0	14'.9	14'.8		

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 30	Moonrise 31	Moonrise 1
N 72°	-	-	-	19:54	-	-
N 70°	-	-	01:18	20:47	20:44	20:44
68°	-	-	02:10	21:20	21:33	22:01
66°	-	-	02:42	21:44	22:05	22:38
64°	-	01:34	03:05	22:03	22:28	23:05
62°	-	02:11	03:23	22:18	22:47	23:25
60°	-	02:37	03:39	22:31	23:02	23:42
N 58°	01:25	02:57	03:51	22:43	23:15	23:56
56°	02:00	03:13	04:02	22:52	23:27	24:08
54°	02:24	03:27	04:12	23:01	23:37	24:19
52°	02:42	03:39	04:20	23:09	23:46	24:28
50°	02:58	03:49	04:28	23:16	23:53	24:37
45°	03:27	04:10	04:44	23:31	-	00:10
N 40°	03:50	04:27	04:57	23:43	-	00:24
35°	04:07	04:41	05:09	23:54	-	00:36
30°	04:21	04:52	05:18	-	00:03	00:46
20°	04:44	05:12	05:35	-	00:19	01:04
N 10°	05:01	05:27	05:49	-	00:33	01:20
0°	05:16	05:41	06:03	-	00:47	01:34
S 10°	05:29	05:54	06:16	00:10	01:00	01:49
20°	05:40	06:07	06:30	00:23	01:14	02:05
30°	05:52	06:21	06:46	00:36	01:30	02:23
35°	05:58	06:28	06:55	00:44	01:40	02:33
40°	06:04	06:37	07:06	00:54	01:51	02:45
45°	06:11	06:46	07:18	01:04	02:04	02:59
S 50°	06:18	06:57	07:33	01:18	02:19	03:17
52°	06:21	07:02	07:40	01:24	02:27	03:25
54°	06:25	07:08	07:47	01:31	02:35	03:34
56°	06:28	07:14	07:56	01:38	02:44	03:44
58°	06:32	07:21	08:06	01:47	02:55	03:56
S 60°	06:37	07:28	08:17	01:56	03:07	04:10
S 62°	06:41	07:37	08:30	02:08	03:21	04:26

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 30	Moonset 31	Moonset 1
N 72°	-	-	-	17:04	-	-
N 70°	22:46	-	-	16:12	17:54	19:34
68°	21:58	-	-	15:40	17:05	18:17
66°	21:28	-	-	15:16	16:34	17:40
64°	21:05	22:33	-	14:58	16:11	17:14
62°	20:47	21:58	-	14:43	15:52	16:53
60°	20:33	21:33	-	14:30	15:37	16:36
N 58°	20:20	21:14	22:42	14:19	15:24	16:22
56°	20:09	20:58	22:10	14:10	15:13	16:10
54°	20:00	20:44	21:47	14:02	15:04	16:00
52°	19:51	20:33	21:29	13:54	14:55	15:51
50°	19:44	20:22	21:13	13:48	14:47	15:42
45°	19:28	20:02	20:44	13:33	14:31	15:24
N 40°	19:15	19:45	20:22	13:21	14:17	15:10
35°	19:04	19:31	20:05	13:11	14:06	14:58
30°	18:54	19:20	19:51	13:03	13:56	14:47
20°	18:37	19:01	19:29	12:47	13:39	14:29
N 10°	18:23	18:45	19:11	12:34	13:24	14:12
0°	18:10	18:32	18:57	12:22	13:10	13:57
S 10°	17:57	18:19	18:44	12:10	12:56	13:43
20°	17:43	18:06	18:33	11:57	12:41	13:26
30°	17:27	17:52	18:21	11:42	12:24	13:08
35°	17:18	17:45	18:15	11:33	12:14	12:57
40°	17:07	17:36	18:09	11:23	12:02	12:45
45°	16:55	17:27	18:02	11:12	11:49	12:31
S 50°	16:41	17:16	17:55	10:58	11:33	12:13
52°	16:34	17:11	17:52	10:51	11:25	12:05
54°	16:26	17:05	17:49	10:44	11:17	11:55
56°	16:17	16:59	17:45	10:36	11:07	11:45
58°	16:08	16:53	17:41	10:27	10:56	11:33
S 60°	15:57	16:45	17:37	10:17	10:44	11:19
S 62°	15:44	16:37	17:32	10:05	10:29	11:02

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
30	6 26	6 25	12:06	06:11	18:34	22d 43%
31	6 23	6 22	12:06	06:58	19:22	23d 33%
1	6 20	6 18	12:06	07:46	20:10	24d 25%

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2013 August 2, 3, 4 (Fri, Sat, Sun)

GMT	ARIES	VENUS -3.9		MARS +1.6		JUPITER -1.9		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
2 Friday 00	310° 45'.2	146° 19'.9	8° 03'.3 N	206° 32'.3	23° 30'.5 N	211° 50'.8	23° 01'.1 N	96° 55'.4	11° 03'.7 S
01	325° 47'.7	161° 19'.6	02'.1	221° 33'.0	30'.3	226° 52'.7	01'.1	111° 57'.8	03'.7
02	340° 50'.1	176° 19'.3	00'.8	236° 33'.6	30'.2	241° 54'.5	01'.1	127° 00'.2	03'.8
03	355° 52'.6	191° 19'.0	7° 59'.6 N	251° 34'.3	30'.0	256° 56'.4	01'.1	142° 02'.6	03'.8
04	10° 55'.1	206° 18'.7	58'.4	266° 35'.0	29'.9	271° 58'.3	01'.0	157° 04'.9	03'.8
05	25° 57'.5	221° 18'.4	57'.2	281° 35'.6	29'.8	287° 00'.2	01'.0	172° 07'.3	03'.9
06	41° 00'.0	236° 18'.1	56'.0	296° 36'.3	29'.6	302° 02'.1	01'.0	187° 09'.7	03'.9
07	56° 02'.4	251° 17'.8	54'.7	311° 37'.0	29'.5	317° 04'.0	00'.9	202° 12'.0	04'.0
08	71° 04'.9	266° 17'.5	53'.5	326° 37'.6	29'.3	332° 05'.9	00'.9	217° 14'.4	04'.0
09	86° 07'.4	281° 17'.2	52'.3	341° 38'.3	29'.2	347° 07'.8	00'.9	232° 16'.8	04'.1
10	101° 09'.8	296° 16'.9	51'.1	356° 39'.0	29'.1	2° 09'.7	00'.9	247° 19'.2	04'.1
11	116° 12'.3	311° 16'.6	49'.9	11° 39'.6	28'.9	17° 11'.6	00'.8	262° 21'.5	04'.1
12	131° 14'.8	326° 16'.4	7° 48'.7 N	26° 40'.3	23° 28'.8 N	32° 13'.5	23° 00'.8 N	277° 23'.9	11° 04'.2 S
13	146° 17'.2	341° 16'.1	47'.4	41° 41'.0	28'.6	47° 15'.4	00'.8	292° 26'.3	04'.2
14	161° 19'.7	356° 15'.8	46'.2	56° 41'.6	28'.5	62° 17'.3	00'.7	307° 28'.6	04'.3
15	176° 22'.2	11° 15'.5	45'.0	71° 42'.3	28'.4	77° 19'.2	00'.7	322° 31'.0	04'.3
16	191° 24'.6	26° 15'.2	43'.8	86° 43'.0	28'.2	92° 21'.1	00'.7	337° 33'.4	04'.4
17	206° 27'.1	41° 14'.9	42'.6	101° 43'.6	28'.1	107° 23'.0	00'.6	352° 35'.7	04'.4
18	221° 29'.6	56° 14'.6	41'.3	116° 44'.3	27'.9	122° 24'.9	00'.6	7° 38'.1	04'.5
19	236° 32'.0	71° 14'.3	40'.1	131° 45'.0	27'.8	137° 26'.8	00'.6	22° 40'.5	04'.5
20	251° 34'.5	86° 14'.0	38'.9	146° 45'.6	27'.6	152° 28'.7	00'.6	37° 42'.9	04'.5
21	266° 36'.9	101° 13'.8	37'.7	161° 46'.3	27'.5	167° 30'.6	00'.5	52° 45'.2	04'.6
22	281° 39'.4	116° 13'.5	36'.4	176° 47'.0	27'.4	182° 32'.4	00'.5	67° 47'.6	04'.6
23	296° 41'.9	131° 13'.2	35'.2	191° 47'.7	27'.2	197° 34'.3	00'.5	82° 50'.0	04'.7
3 Saturday 00	311° 44'.3	146° 12'.9	7° 34'.0 N	206° 48'.3	23° 27'.1 N	212° 36'.2	23° 00'.4 N	97° 52'.3	11° 04'.7 S
01	326° 46'.8	161° 12'.6	32'.8	221° 49'.0	26'.9	227° 38'.1	00'.4	112° 54'.7	04'.8
02	341° 49'.3	176° 12'.3	31'.5	236° 49'.7	26'.8	242° 40'.0	00'.4	127° 57'.1	04'.8
03	356° 51'.7	191° 12'.0	30'.3	251° 50'.3	26'.6	257° 41'.9	00'.4	142° 59'.4	04'.9
04	11° 54'.2	206° 11'.8	29'.1	266° 51'.0	26'.5	272° 43'.8	00'.3	158° 01'.8	04'.9
05	26° 56'.7	221° 11'.5	27'.9	281° 51'.7	26'.3	287° 45'.7	00'.3	173° 04'.2	04'.9
06	41° 59'.1	236° 11'.2	26'.6	296° 52'.4	26'.2	302° 47'.6	00'.3	188° 06'.5	05'.0
07	57° 01'.6	251° 10'.9	25'.4	311° 53'.0	26'.0	317° 49'.5	00'.2	203° 08'.9	05'.0
08	72° 04'.1	266° 10'.6	24'.2	326° 53'.7	25'.9	332° 51'.4	00'.2	218° 11'.3	05'.1
09	87° 06'.5	281° 10'.3	23'.0	341° 54'.4	25'.7	347° 53'.3	00'.2	233° 13'.6	05'.1
10	102° 09'.0	296° 10'.0	21'.7	356° 55'.0	25'.6	2° 55'.2	00'.1	248° 16'.0	05'.2
11	117° 11'.4	311° 09'.8	20'.5	11° 55'.7	25'.4	17° 57'.1	00'.1	263° 18'.4	05'.2
12	132° 13'.9	326° 09'.5	7° 19'.3 N	26° 56'.4	23° 25'.3 N	32° 59'.0	23° 00'.1 N	278° 20'.7	11° 05'.3 S
13	147° 16'.4	341° 09'.2	18'.1	41° 57'.1	25'.1	48° 00'.9	00'.1	293° 23'.1	05'.3
14	162° 18'.8	356° 08'.9	16'.8	56° 57'.7	25'.0	63° 02'.8	00'.0	308° 25'.5	05'.3
15	177° 21'.3	11° 08'.6	15'.6	71° 58'.4	24'.8	78° 04'.7	00'.0	323° 27'.8	05'.4
16	192° 23'.8	26° 08'.4	14'.4	86° 59'.1	24'.7	93° 06'.6	00'.0	338° 30'.2	05'.4
17	207° 26'.2	41° 08'.1	13'.1	101° 59'.7	24'.5	108° 08'.5	22° 59'.9 N	353° 32'.6	05'.5
18	222° 28'.7	56° 07'.8	11'.9	117° 00'.4	24'.4	123° 10'.4	59'.9	8° 34'.9	05'.5
19	237° 31'.2	71° 07'.5	10'.7	132° 01'.1	24'.2	138° 12'.3	59'.9	23° 37'.3	05'.6
20	252° 33'.6	86° 07'.2	09'.5	147° 01'.8	24'.1	153° 14'.2	59'.8	38° 39'.7	05'.6
21	267° 36'.1	101° 07'.0	08'.2	162° 02'.4	23'.9	168° 16'.1	59'.8	53° 42'.0	05'.7
22	282° 38'.6	116° 06'.7	07'.0	177° 03'.1	23'.8	183° 18'.0	59'.8	68° 44'.4	05'.7
23	297° 41'.0	131° 06'.4	05'.8	192° 03'.8	23'.6	198° 19'.9	59'.8	83° 46'.8	05'.7
4 Sunday 00	312° 43'.5	146° 06'.1	7° 04'.5 N	207° 04'.5	23° 23'.5 N	213° 21'.8	22° 59'.7 N	98° 49'.1	11° 05'.8 S
01	327° 45'.9	161° 05'.8	03'.3	222° 05'.1	23'.3	228° 23'.7	59'.7	113° 51'.5	05'.8
02	342° 48'.4	176° 05'.6	02'.1	237° 05'.8	23'.2	243° 25'.6	59'.7	128° 53'.9	05'.9
03	357° 50'.9	191° 05'.3	00'.8	252° 06'.5	23'.0	258° 27'.5	59'.6	143° 56'.2	05'.9
04	12° 53'.3	206° 05'.0	6° 59'.6 N	267° 07'.1	22'.9	273° 29'.4	59'.6	158° 58'.6	06'.0
05	27° 55'.8	221° 04'.7	58'.4	282° 07'.8	22'.7	288° 31'.3	59'.6	174° 01'.0	06'.0
06	42° 58'.3	236° 04'.5	57'.1	297° 08'.5	22'.6	303° 33'.2	59'.5	189° 03'.3	06'.1
07	58° 00'.7	251° 04'.2	55'.9	312° 09'.2	22'.4	318° 35'.1	59'.5	204° 05'.7	06'.1
08	73° 03'.2	266° 03'.9	54'.7	327° 09'.8	22'.3	333° 37'.0	59'.5	219° 08'.0	06'.2
09	88° 05'.7	281° 03'.6	53'.4	342° 10'.5	22'.1	348° 38'.9	59'.5	234° 10'.4	06'.2
10	103° 08'.1	296° 03'.4	52'.2	357° 11'.2	21'.9	3° 40'.8	59'.4	249° 12'.8	06'.3
11	118° 10'.6	311° 03'.1	51'.0	12° 11'.9	21'.8	18° 42'.7	59'.4	264° 15'.1	06'.3
12	133° 13'.0	326° 02'.8	6° 49'.7 N	27° 12'.6	23° 21'.6 N	33° 44'.6	22° 59'.4 N	279° 17'.5	11° 06'.3 S
13	148° 15'.5	341° 02'.5	48'.5	42° 13'.2	21'.5	48° 46'.5	59'.3	294° 19'.9	06'.4
14	163° 18'.0	356° 02'.3	47'.3	57° 13'.9	21'.3	63° 48'.4	59'.3	309° 22'.2	06'.4
15	178° 20'.4	11° 02'.0	46'.0	72° 14'.6	21'.2	78° 50'.3	59'.3	324° 24'.6	06'.5
16	193° 22'.9	26° 01'.7	44'.8	87° 15'.3	21'.0	93° 52'.2	59'.2	339° 26'.9	06'.5
17	208° 25'.4	41° 01'.4	43'.5	102° 15'.9	20'.8	108° 54'.1	59'.2	354° 29'.3	06'.6
18	223° 27'.8	56° 01'.2	42'.3	117° 16'.6	20'.7	123° 56'.0	59'.2	9° 31'.7	06'.6
19	238° 30'.3	71° 00'.9	41'.1	132° 17'.3	20'.5	138° 57'.9	59'.1	24° 34'.0	06'.7
20	253° 32'.8	86° 00'.6	39'.8	147° 18'.0	20'.4	153° 59'.8	59'.1	39° 36'.4	06'.7
21	268° 35'.2	101° 00'.4	38'.6	162° 18'.6	20'.2	169° 01'.7	59'.1	54° 38'.8	06'.8
22	283° 37'.7	116° 00'.1	37'.4	177° 19'.3	20'.0	184° 03'.6	59'.1	69° 41'.1	06'.8
23	298° 40'.2	130° 59'.8	36'.1	192° 20'.0	19'.9	199° 05'.5	59'.0	84° 43'.5	06'.9
	M.P. 03:09	v -0'.3	d 1'.2	v 0'.7	d 0'.1	v 1'.9	d 0'.0	v 2'.4	d 0'.0

Name	SHA	Dec
Acamar	315° 18'.3	40° 14'.8 S
Achernar	335° 26'.6	57° 09'.7 S
Acrux	173° 09'.5	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.5 S
Aldebaran	290° 49'.4	16° 32'.1 N
Alioth	166° 20'.9	55° 53'.4 N
Alkaid	152° 58'.9	49° 15'.0 N
Alnair	27° 43'.2	46° 53'.4 S
Alnilam	275° 46'.5	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.1 S
Alphecca	126° 10'.8	26° 40'.4 N
Alpheratz	357° 43'.1	29° 10'.0 N
Altair	62° 07'.8	8° 54'.5 N
Ankaa	353° 15'.4	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.9 N
Atria	107° 27'.3	69° 03'.2 S
Avior	234° 18'.6	59° 33'.3 S
Bellatrix	278° 32'.1	6° 21'.6 N
Betelgeuse	271° 01'.4	7° 24'.5 N
Canopus	263° 56'.5	52° 42'.1 S
Capella	280° 34'.6	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.0 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.6	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.8 N
Elnath	278° 12'.7	28° 36'.9 N
Eltanin	90° 45'.7	51° 29'.6 N
Enif	33° 46'.7	9° 56'.5 N
Fomalhaut	15° 23'.6	29° 32'.7 S
Gacrux	172° 01'.0	57° 11'.6 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.5 S
Hamal	328° 00'.6	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 20'.1	74° 06'.3 N
Markab	13° 37'.9	15° 16'.9 N
Menkar	314° 15'.0	4° 08'.6 N
Menkent	148° 07'.4	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.6 S
Mirfak	308° 40'.2	49° 54'.3 N
Nunki	75° 57'.8	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.2 S
Polaris	317° 43'.9	89° 19'.0 N
Pollux	243° 28'.0	27° 59'.4 N
Procyon	244° 59'.9	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.2	8° 11'.2 S
Rigil Kent	139° 51'.4	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.0	56° 36'.6 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 33'.9	16° 44'.1 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.4 S
Vega	80° 38'.5	38° 48'.1 N
Zuben'ubi	137° 05'.2	16° 05'.8 S

	SHA	Mer.Pass.
Venus	194° 28'.6	14:15
Mars	255° 04'.0	10:12
Jupiter	260° 51'.9	09:48
Saturn	146° 08'.0	17:26

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
2 Friday 00	178° 26'.0	17° 46'.3 N	235° 40'.5	12'.0	19° 57'.6 N	0'.8	54'.2
01	193° 26'.0	45'.6	250° 11'.5	12'.0	58'.4	0'.7	54'.1
02	208° 26'.1	45'.0	264° 42'.5	11'.9	59'.1	0'.6	
03	223° 26'.1	44'.3	279° 13'.4	12'.0	59'.7	0'.6	
04	238° 26'.2	43'.7	293° 44'.4	12'.0	20° 00'.3 N	0'.4	
05	253° 26'.2	43'.0	308° 15'.4	12'.0	00'.7	0'.4	
06	268° 26'.3	42'.4	322° 46'.4	12'.0	01'.1	0'.2	
07	283° 26'.3	41'.8	337° 17'.4	12'.0	01'.3	0'.2	
08	298° 26'.4	41'.1	351° 48'.4	12'.0	01'.5	0'.1	
09	313° 26'.4	40'.5	6° 19'.4	12'.0	01'.6	0'.0	
10	328° 26'.4	39'.8	20° 50'.4	12'.1	01'.6	0'.1	
11	343° 26'.5	39'.2	35° 21'.5	12'.0	01'.5	0'.2	
12	358° 26'.5	17° 38'.5 N	49° 52'.5	12'.0	20° 01'.3 N	0'.3	54'.1
13	13° 26'.6	37'.9	64° 23'.5	12'.0	01'.0	0'.4	
14	28° 26'.6	37'.2	78° 54'.5	12'.1	00'.6	0'.5	
15	43° 26'.7	36'.6	93° 25'.6	12'.0	00'.1	0'.5	
16	58° 26'.7	35'.9	107° 56'.6	12'.0	19° 59'.6 N	0'.7	
17	73° 26'.8	35'.3	122° 27'.6	12'.1	58'.9	0'.8	
18	88° 26'.8	34'.6	136° 58'.7	12'.0	58'.1	0'.8	
19	103° 26'.9	34'.0	151° 29'.7	12'.1	57'.3	0'.9	
20	118° 26'.9	33'.3	166° 00'.8	12'.1	56'.4	1'.1	54'.0
21	133° 27'.0	32'.7	180° 31'.9	12'.1	55'.3	1'.1	
22	148° 27'.0	32'.0	195° 03'.0	12'.0	54'.2	1'.2	
23	163° 27'.1	31'.4	209° 34'.0	12'.1	53'.0	1'.3	
3 Saturday 00	178° 27'.1	17° 30'.7 N	224° 05'.1	12'.1	19° 51'.7 N	1'.4	54'.0
01	193° 27'.2	30'.1	238° 36'.2	12'.1	50'.3	1'.5	
02	208° 27'.2	29'.4	253° 07'.3	12'.2	48'.8	1'.5	
03	223° 27'.3	28'.8	267° 38'.5	12'.1	47'.3	1'.7	
04	238° 27'.3	28'.1	282° 09'.6	12'.1	45'.6	1'.8	
05	253° 27'.4	27'.5	296° 40'.7	12'.2	43'.8	1'.8	
06	268° 27'.4	26'.8	311° 11'.9	12'.1	42'.0	1'.9	
07	283° 27'.5	26'.2	325° 43'.0	12'.2	40'.1	2'.1	
08	298° 27'.5	25'.5	340° 14'.2	12'.2	38'.0	2'.1	
09	313° 27'.6	24'.8	354° 45'.4	12'.2	35'.9	2'.2	
10	328° 27'.6	24'.2	9° 16'.6	12'.2	33'.7	2'.3	
11	343° 27'.7	23'.5	23° 47'.8	12'.2	31'.4	2'.4	
12	358° 27'.7	17° 22'.9 N	38° 19'.0	12'.2	19° 29'.0 N	2'.4	54'.0
13	13° 27'.8	22'.2	52° 50'.2	12'.3	26'.6	2'.6	
14	28° 27'.8	21'.5	67° 21'.5	12'.2	24'.0	2'.6	
15	43° 27'.9	20'.9	81° 52'.7	12'.3	21'.4	2'.8	
16	58° 27'.9	20'.2	96° 24'.0	12'.3	18'.6	2'.8	
17	73° 28'.0	19'.6	110° 55'.3	12'.3	15'.8	2'.9	
18	88° 28'.0	18'.9	125° 26'.6	12'.3	12'.9	3'.0	
19	103° 28'.1	18'.2	139° 57'.9	12'.3	09'.9	3'.1	
20	118° 28'.2	17'.6	154° 29'.2	12'.3	06'.8	3'.2	
21	133° 28'.2	16'.9	169° 00'.5	12'.4	03'.6	3'.3	
22	148° 28'.3	16'.3	183° 31'.9	12'.3	00'.3	3'.3	
23	163° 28'.3	15'.6	198° 03'.2	12'.4	18° 57'.0 N	3'.5	54'.1
4 Sunday 00	178° 28'.4	17° 14'.9 N	212° 34'.6	12'.4	18° 53'.5 N	3'.5	54'.1
01	193° 28'.4	14'.3	227° 06'.0	12'.4	50'.0	3'.6	
02	208° 28'.5	13'.6	241° 37'.4	12'.5	46'.4	3'.7	
03	223° 28'.5	12'.9	256° 08'.9	12'.4	42'.7	3'.8	
04	238° 28'.6	12'.3	270° 40'.3	12'.5	38'.9	3'.9	
05	253° 28'.7	11'.6	285° 11'.8	12'.4	35'.0	3'.9	
06	268° 28'.7	10'.9	299° 43'.2	12'.5	31'.1	4'.0	
07	283° 28'.8	10'.3	314° 14'.7	12'.6	27'.1	4'.2	
08	298° 28'.8	09'.6	328° 46'.3	12'.5	22'.9	4'.2	
09	313° 28'.9	08'.9	343° 17'.8	12'.5	18'.7	4'.3	
10	328° 28'.9	08'.3	357° 49'.3	12'.6	14'.4	4'.3	
11	343° 29'.0	07'.6	12° 20'.9	12'.6	10'.1	4'.5	
12	358° 29'.1	17° 06'.9 N	26° 52'.5	12'.6	18° 05'.6 N	4'.5	54'.1
13	13° 29'.1	06'.2	41° 24'.1	12'.6	01'.1	4'.7	
14	28° 29'.2	05'.6	55° 55'.7	12'.6	17° 56'.4 N	4'.7	
15	43° 29'.2	04'.9	70° 27'.3	12'.7	51'.7	4'.7	
16	58° 29'.3	04'.2	84° 59'.0	12'.7	47'.0	4'.9	
17	73° 29'.4	03'.6	99° 30'.7	12'.7	42'.1	5'.0	
18	88° 29'.4	02'.9	114° 02'.4	12'.7	37'.1	5'.0	
19	103° 29'.5	02'.2	128° 34'.1	12'.7	32'.1	5'.1	
20	118° 29'.5	01'.5	143° 05'.8	12'.8	27'.0	5'.2	54'.2
21	133° 29'.6	00'.9	157° 37'.6	12'.7	21'.8	5'.3	
22	148° 29'.7	00'.2	172° 09'.3	12'.8	16'.5	5'.3	
23	163° 29'.7	16° 59'.5 N	186° 41'.1	12'.8	11'.2	5'.4	
	SD 15'.8	d 0'.7	SD 14'.7		14'.7	14'.7	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 2	Moonrise 3	Moonrise 4
N 72°	-	-	-	-	-	23:53
N 70°	-	-	01:44	21:31	23:09	24:50
68°	-	-	02:26	22:49	-	00:00
66°	-	00:55	02:54	23:27	-	00:32
64°	-	01:52	03:15	23:54	-	00:55
62°	-	02:23	03:32	-	00:14	01:14
60°	00:49	02:47	03:46	-	00:31	01:29
N 58°	01:41	03:05	03:58	-	00:45	01:42
56°	02:10	03:20	04:08	00:08	00:57	01:53
54°	02:32	03:33	04:17	00:19	01:07	02:03
52°	02:49	03:44	04:25	00:28	01:17	02:11
50°	03:04	03:54	04:32	00:37	01:25	02:19
45°	03:32	04:14	04:48	00:54	01:43	02:36
N 40°	03:53	04:30	05:00	01:09	01:58	02:49
35°	04:10	04:43	05:11	01:21	02:10	03:01
30°	04:23	04:54	05:20	01:32	02:21	03:11
20°	04:45	05:13	05:36	01:51	02:39	03:28
N 10°	05:02	05:28	05:50	02:07	02:55	03:44
0°	05:16	05:41	06:03	02:22	03:10	03:58
S 10°	05:28	05:53	06:15	02:37	03:25	04:12
20°	05:39	06:06	06:29	02:54	03:41	04:27
30°	05:50	06:19	06:44	03:12	04:00	04:44
35°	05:56	06:26	06:53	03:23	04:10	04:54
40°	06:01	06:34	07:03	03:36	04:23	05:05
45°	06:08	06:43	07:14	03:51	04:37	05:19
S 50°	06:14	06:53	07:28	04:09	04:55	05:35
52°	06:17	06:58	07:35	04:17	05:03	05:43
54°	06:20	07:03	07:42	04:27	05:13	05:51
56°	06:24	07:09	07:50	04:38	05:23	06:01
58°	06:27	07:15	07:59	04:50	05:35	06:12
S 60°	06:31	07:22	08:10	05:05	05:49	06:24
S 62°	06:35	07:30	08:22	05:22	06:06	06:39

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 2	Moonset 3	Moonset 4
N 72°	-	-	-	-	-	21:21
N 70°	22:22	-	-	20:27	20:27	20:24
68°	21:43	-	-	19:08	19:36	19:50
66°	21:16	23:07	-	18:30	19:04	19:26
64°	20:55	22:16	-	18:04	18:40	19:06
62°	20:39	21:46	-	17:43	18:21	18:50
60°	20:25	21:23	23:13	17:26	18:06	18:37
N 58°	20:13	21:05	22:27	17:12	17:53	18:26
56°	20:03	20:50	21:59	17:00	17:41	18:16
54°	19:54	20:38	21:38	16:49	17:31	18:07
52°	19:46	20:27	21:21	16:40	17:23	17:59
50°	19:39	20:17	21:07	16:31	17:15	17:52
45°	19:24	19:57	20:39	16:13	16:57	17:37
N 40°	19:11	19:41	20:18	15:59	16:44	17:24
35°	19:01	19:28	20:02	15:46	16:32	17:14
30°	18:52	19:17	19:48	15:36	16:21	17:04
20°	18:36	18:59	19:27	15:17	16:03	16:48
N 10°	18:22	18:44	19:10	15:01	15:48	16:34
0°	18:10	18:31	18:56	14:45	15:33	16:20
S 10°	17:57	18:19	18:44	14:30	15:19	16:07
20°	17:44	18:07	18:33	14:14	15:03	15:53
30°	17:29	17:54	18:23	13:55	14:45	15:36
35°	17:20	17:47	18:17	13:44	14:34	15:26
40°	17:10	17:39	18:11	13:32	14:22	15:15
45°	16:59	17:30	18:05	13:17	14:08	15:03
S 50°	16:45	17:20	17:59	12:59	13:50	14:47
52°	16:38	17:15	17:56	12:50	13:42	14:39
54°	16:31	17:10	17:53	12:41	13:33	14:31
56°	16:23	17:04	17:49	12:30	13:22	14:22
58°	16:14	16:58	17:46	12:18	13:11	14:11
S 60°	16:03	16:51	17:42	12:03	12:57	13:59
S 62°	15:51	16:43	17:38	11:46	12:40	13:45

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
2	6 16	6 14	12:06	08:34	20:58	25d 17%
3	6 12	6 09	12:06	09:22	21:45	26d 11%
4	6 07	6 04	12:06	10:09	22:32	27d 5%

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2013 August 5, 6, 7 (Mon, Tue, Wed)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -1.9		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
5 Monday 00	313° 42'.6	145° 59'.5	6° 34'.9 N	207° 20'.7	23° 19'.7 N	214° 07'.4	22° 59'.0 N	99° 45'.8	11° 06'.9 S
01	328° 45'.1	160° 59'.3	33'.6	222° 21'.3	19'.6	229° 09'.3	59'.0	114° 48'.2	06'.9
02	343° 47'.5	175° 59'.0	32'.4	237° 22'.0	19'.4	244° 11'.2	58'.9	129° 50'.6	07'.0
03	358° 50'.0	190° 58'.7	31'.2	252° 22'.7	19'.2	259° 13'.1	58'.9	144° 52'.9	07'.0
04	13° 52'.5	205° 58'.5	29'.9	267° 23'.4	19'.1	274° 15'.0	58'.9	159° 55'.3	07'.1
05	28° 54'.9	220° 58'.2	28'.7	282° 24'.1	18'.9	289° 16'.9	58'.8	174° 57'.6	07'.1
06	43° 57'.4	235° 57'.9	27'.4	297° 24'.7	18'.8	304° 18'.8	58'.8	190° 00'.0	07'.2
07	58° 59'.9	250° 57'.7	26'.2	312° 25'.4	18'.6	319° 20'.7	58'.8	205° 02'.4	07'.2
08	74° 02'.3	265° 57'.4	25'.0	327° 26'.1	18'.4	334° 22'.6	58'.7	220° 04'.7	07'.3
09	89° 04'.8	280° 57'.1	23'.7	342° 26'.8	18'.3	349° 24'.5	58'.7	235° 07'.1	07'.3
10	104° 07'.3	295° 56'.9	22'.5	357° 27'.5	18'.1	4° 26'.4	58'.7	250° 09'.4	07'.4
11	119° 09'.7	310° 56'.6	21'.2	12° 28'.1	17'.9	19° 28'.3	58'.7	265° 11'.8	07'.4
12	134° 12'.2	325° 56'.3	6° 20'.0 N	27° 28'.8	23° 17'.8 N	34° 30'.2	22° 58'.6 N	280° 14'.2	11° 07'.5 S
13	149° 14'.7	340° 56'.1	18'.8	42° 29'.5	17'.6	49° 32'.1	58'.6	295° 16'.5	07'.5
14	164° 17'.1	355° 55'.8	17'.5	57° 30'.2	17'.4	64° 34'.0	58'.6	310° 18'.9	07'.6
15	179° 19'.6	10° 55'.5	16'.3	72° 30'.9	17'.3	79° 35'.9	58'.5	325° 21'.2	07'.6
16	194° 22'.0	25° 55'.3	15'.0	87° 31'.5	17'.1	94° 37'.8	58'.5	340° 23'.6	07'.7
17	209° 24'.5	40° 55'.0	13'.8	102° 32'.2	17'.0	109° 39'.7	58'.5	355° 26'.0	07'.7
18	224° 27'.0	55° 54'.7	12'.5	117° 32'.9	16'.8	124° 41'.6	58'.4	10° 28'.3	07'.7
19	239° 29'.4	70° 54'.5	11'.3	132° 33'.6	16'.6	139° 43'.5	58'.4	25° 30'.7	07'.8
20	254° 31'.9	85° 54'.2	10'.1	147° 34'.3	16'.5	154° 45'.4	58'.4	40° 33'.0	07'.8
21	269° 34'.4	100° 53'.9	08'.8	162° 34'.9	16'.3	169° 47'.3	58'.3	55° 35'.4	07'.9
22	284° 36'.8	115° 53'.7	07'.6	177° 35'.6	16'.1	184° 49'.2	58'.3	70° 37'.8	07'.9
23	299° 39'.3	130° 53'.4	06'.3	192° 36'.3	15'.9	199° 51'.1	58'.3	85° 40'.1	08'.0
6 Tuesday 00	314° 41'.8	145° 53'.1	6° 05'.1 N	207° 37'.0	23° 15'.8 N	214° 53'.1	22° 58'.2 N	100° 42'.5	11° 08'.0 S
01	329° 44'.2	160° 52'.9	03'.8	222° 37'.7	15'.6	229° 55'.0	58'.2	115° 44'.8	08'.1
02	344° 46'.7	175° 52'.6	02'.6	237° 38'.3	15'.4	244° 56'.9	58'.2	130° 47'.2	08'.1
03	359° 49'.2	190° 52'.4	01'.3	252° 39'.0	15'.3	259° 58'.8	58'.2	145° 49'.5	08'.2
04	14° 51'.6	205° 52'.1	00'.1	267° 39'.7	15'.1	275° 00'.7	58'.1	160° 51'.9	08'.2
05	29° 54'.1	220° 51'.8	5° 58'.8 N	282° 40'.4	14'.9	290° 02'.6	58'.1	175° 54'.3	08'.3
06	44° 56'.5	235° 51'.6	57'.6	297° 41'.1	14'.8	305° 04'.5	58'.1	190° 56'.6	08'.3
07	59° 59'.0	250° 51'.3	56'.3	312° 41'.8	14'.6	320° 06'.4	58'.0	205° 59'.0	08'.4
08	75° 01'.5	265° 51'.1	55'.1	327° 42'.4	14'.4	335° 08'.3	58'.0	221° 01'.3	08'.4
09	90° 03'.9	280° 50'.8	53'.9	342° 43'.1	14'.3	350° 10'.2	58'.0	236° 03'.7	08'.5
10	105° 06'.4	295° 50'.5	52'.6	357° 43'.8	14'.1	5° 12'.1	57'.9	251° 06'.0	08'.5
11	120° 08'.9	310° 50'.3	51'.4	12° 44'.5	13'.9	20° 14'.0	57'.9	266° 08'.4	08'.6
12	135° 11'.3	325° 50'.0	5° 50'.1 N	27° 45'.2	23° 13'.7 N	35° 15'.9	22° 57'.9 N	281° 10'.7	11° 08'.6 S
13	150° 13'.8	340° 49'.8	48'.9	42° 45'.9	13'.6	50° 17'.8	57'.8	296° 13'.1	08'.7
14	165° 16'.3	355° 49'.5	47'.6	57° 46'.5	13'.4	65° 19'.7	57'.8	311° 15'.5	08'.7
15	180° 18'.7	10° 49'.2	46'.4	72° 47'.2	13'.2	80° 21'.6	57'.8	326° 17'.8	08'.8
16	195° 21'.2	25° 49'.0	45'.1	87° 47'.9	13'.0	95° 23'.5	57'.7	341° 20'.2	08'.8
17	210° 23'.6	40° 48'.7	43'.9	102° 48'.6	12'.9	110° 25'.4	57'.7	356° 22'.5	08'.9
18	225° 26'.1	55° 48'.5	42'.6	117° 49'.3	12'.7	125° 27'.3	57'.7	11° 24'.9	08'.9
19	240° 28'.6	70° 48'.2	41'.4	132° 50'.0	12'.5	140° 29'.3	57'.6	26° 27'.2	08'.9
20	255° 31'.0	85° 47'.9	40'.1	147° 50'.6	12'.4	155° 31'.2	57'.6	41° 29'.6	09'.0
21	270° 33'.5	100° 47'.7	38'.9	162° 51'.3	12'.2	170° 33'.1	57'.6	56° 31'.9	09'.0
22	285° 36'.0	115° 47'.4	37'.6	177° 52'.0	12'.0	185° 35'.0	57'.5	71° 34'.3	09'.1
23	300° 38'.4	130° 47'.2	36'.4	192° 52'.7	11'.8	200° 36'.9	57'.5	86° 36'.7	09'.1
7 Wednesday 00	315° 40'.9	145° 46'.9	5° 35'.1 N	207° 53'.4	23° 11'.7 N	215° 38'.8	22° 57'.5 N	101° 39'.0	11° 09'.2 S
01	330° 43'.4	160° 46'.7	33'.9	222° 54'.1	11'.5	230° 40'.7	57'.5	116° 41'.4	09'.2
02	345° 45'.8	175° 46'.4	32'.6	237° 54'.8	11'.3	245° 42'.6	57'.4	131° 43'.7	09'.3
03	0° 48'.3	190° 46'.2	31'.4	252° 55'.4	11'.1	260° 44'.5	57'.4	146° 46'.1	09'.3
04	15° 50'.8	205° 45'.9	30'.1	267° 56'.1	10'.9	275° 46'.4	57'.4	161° 48'.4	09'.4
05	30° 53'.2	220° 45'.6	28'.8	282° 56'.8	10'.8	290° 48'.3	57'.3	176° 50'.8	09'.4
06	45° 55'.7	235° 45'.4	27'.6	297° 57'.5	10'.6	305° 50'.2	57'.3	191° 53'.1	09'.5
07	60° 58'.1	250° 45'.1	26'.3	312° 58'.2	10'.4	320° 52'.1	57'.3	206° 55'.5	09'.5
08	76° 00'.6	265° 44'.9	25'.1	327° 58'.9	10'.2	335° 54'.0	57'.2	221° 57'.8	09'.6
09	91° 03'.1	280° 44'.6	23'.8	342° 59'.6	10'.1	350° 56'.0	57'.2	237° 00'.2	09'.6
10	106° 05'.5	295° 44'.4	22'.6	358° 00'.2	09'.9	5° 57'.9	57'.2	252° 02'.5	09'.7
11	121° 08'.0	310° 44'.1	21'.3	13° 00'.9	09'.7	20° 59'.8	57'.1	267° 04'.9	09'.7
12	136° 10'.5	325° 43'.9	5° 20'.1 N	28° 01'.6	23° 09'.5 N	36° 01'.7	22° 57'.1 N	282° 07'.2	11° 09'.8 S
13	151° 12'.9	340° 43'.6	18'.8	43° 02'.3	09'.3	51° 03'.6	57'.1	297° 09'.6	09'.8
14	166° 15'.4	355° 43'.4	17'.6	58° 03'.0	09'.2	66° 05'.5	57'.0	312° 11'.9	09'.9
15	181° 17'.9	10° 43'.1	16'.3	73° 03'.7	09'.0	81° 07'.4	57'.0	327° 14'.3	09'.9
16	196° 20'.3	25° 42'.9	15'.1	88° 04'.4	08'.8	96° 09'.3	57'.0	342° 16'.6	10'.0
17	211° 22'.8	40° 42'.6	13'.8	103° 05'.1	08'.6	111° 11'.2	56'.9	357° 19'.0	10'.0
18	226° 25'.3	55° 42'.4	12'.5	118° 05'.8	08'.4	126° 13'.1	56'.9	12° 21'.4	10'.1
19	241° 27'.7	70° 42'.1	11'.3	133° 06'.4	08'.3	141° 15'.0	56'.9	27° 23'.7	10'.1
20	256° 30'.2	85° 41'.9	10'.0	148° 07'.1	08'.1	156° 16'.9	56'.8	42° 26'.1	10'.2
21	271° 32'.6	100° 41'.6	08'.8	163° 07'.8	07'.9	171° 18'.9	56'.8	57° 28'.4	10'.2
22	286° 35'.1	115° 41'.4	07'.5	178° 08'.5	07'.7	186° 20'.8	56'.8	72° 30'.8	10'.3
23	301° 37'.6	130° 41'.1	06'.3	193° 09'.2	07'.5	201° 22'.7	56'.7	87° 33'.1	10'.3
	M.P. 02:57	v -0'.3	d 1'.2	v 0'.7	d 0'.2	v 1'.9	d 0'.0	v 2'.4	d 0'.0

STARS	SHA	Dec
Acamar	315° 18'.3	40° 14'.8 S
Achernar	335° 26'.6	57° 09'.7 S
Acrux	173° 09'.5	63° 10'.7 S
Adhara	255° 12'.8	28° 59'.5 S
Aldebaran	290° 49'.4	16° 32'.1 N
Alioth	166° 20'.9	55° 53'.4 N
Alkaid	152° 59'.0	49° 15'.0 N
Alnair	27° 43'.2	46° 53'.4 S
Alnilam	275° 46'.5	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.1 S
Alphecca	126° 10'.8	26° 40'.4 N
Alpheratz	357° 43'.1	29° 10'.0 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.4	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.9 N
Atria	107° 27'.3	69° 03'.2 S
Avior	234° 18'.6	59° 33'.3 S
Bellatrix	278° 32'.1	6° 21'.6 N
Betelgeuse	271° 01'.4	7° 24'.5 N
Canopus	263° 56'.5	52° 42'.1 S
Capella	280° 34'.5	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.0 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.6	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.7 N
Elnath	278° 12'.7	28° 36'.9 N
Eltanin	90° 45'.7	51° 29'.6 N
Enif	33° 46'.7	9° 56'.5 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.0	57° 11'.6 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.8	60° 26'.5 S
Hamal	328° 00'.5	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 20'.1	74° 06'.3 N
Markab	13° 37'.9	15° 16'.9 N
Menkar	314° 14'.9	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.5 S
Mirfak	308° 40'.2	49° 54'.3 N
Nunki	75° 57'.8	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 42'.4	89° 19'.0 N
Pollux	243° 27'.9	27° 59'.4 N
Procyon	244° 59'.9	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.1	8° 11'.2 S
Rigil Kent	139° 51'.5	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.0	56° 36'.6 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 33'.9	16° 44'.1 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.4 S
Vega	80° 38'.5	38° 48'.1 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	191° 11'.4	14:17
Mars	252° 55'.2	10:09
Jupiter	260° 11'.3	09:39
Saturn	146° 00'.7	17:14

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP
178° 29'.8	16° 58'.8 N	201° 12'.9	12'.9	17° 05'.8 N	5'.5	54'.2
193° 29'.8	58'.2	215° 44'.8	12'.8	00'.3	5'.6	
208° 29'.9	57'.5	230° 16'.6	12'.9	16° 54'.7 N	5'.7	
223° 30'.0	56'.8	244° 48'.5	12'.9	49'.0	5'.7	
238° 30'.0	56'.1	259° 20'.4	12'.9	43'.3	5'.8	
253° 30'.1	55'.5	273° 52'.3	12'.9	37'.5	5'.9	
268° 30'.2	54'.8	288° 24'.2	13'.0	31'.6	6'.0	
283° 30'.2	54'.1	302° 56'.2	12'.9	25'.6	6'.0	
298° 30'.3	53'.4	317° 28'.1	13'.0	19'.6	6'.1	
313° 30'.4	52'.7	332° 00'.1	13'.0	13'.5	6'.2	54'.3
328° 30'.4	52'.1	346° 32'.1	13'.1	07'.3	6'.3	
343° 30'.5	51'.4	1° 04'.2	13'.0	01'.0	6'.3	
358° 30'.5	16° 50'.7 N	15° 36'.2	13'.1	15° 54'.7 N	6'.4	54'.3
13° 30'.6	50'.0	30° 08'.3	13'.1	48'.3	6'.5	
28° 30'.7	49'.3	44° 40'.4	13'.1	41'.8	6'.5	
43° 30'.7	48'.6	59° 12'.5	13'.1	35'.3	6'.7	
58° 30'.8	48'.0	73° 44'.6	13'.2	28'.6	6'.6	
73° 30'.9	47'.3	88° 16'.8	13'.1	22'.0	6'.8	
88° 30'.9	46'.6	102° 48'.9	13'.2	15'.2	6'.8	
103° 31'.0	45'.9	117° 21'.1	13'.3	08'.4	7'.0	54'.4
118° 31'.1	45'.2	131° 53'.4	13'.2	01'.4	6'.9	
133° 31'.1	44'.5	146° 25'.6	13'.2	14° 54'.5 N	7'.1	
148° 31'.2	43'.8	160° 57'.8	13'.3	47'.4	7'.1	
163° 31'.3	43'.2	175° 30'.1	13'.3	40'.3	7'.2	
178° 31'.3	16° 42'.5 N	190° 02'.4	13'.3	14° 33'.1 N	7'.2	54'.4
193° 31'.4	41'.8	204° 34'.7	13'.3	25'.9	7'.3	
208° 31'.5	41'.1	219° 07'.0	13'.4	18'.6	7'.4	
223° 31'.6	40'.4	233° 39'.4	13'.4	11'.2	7'.4	
238° 31'.6	39'.7	248° 11'.8	13'.4	03'.8	7'.5	
253° 31'.7	39'.0	262° 44'.2	13'.4	13° 56'.3 N	7'.6	54'.5
268° 31'.8	38'.3	277° 16'.6	13'.4	48'.7	7'.7	
283° 31'.8	37'.7	291° 49'.0	13'.4	41'.0	7'.6	
298° 31'.9	37'.0	306° 21'.4	13'.5	33'.4	7'.8	
313° 32'.0	36'.3	320° 53'.9	13'.5	25'.6	7'.8	
328° 32'.0	35'.6	335° 26'.4	13'.5	17'.8	7'.9	
343° 32'.1	34'.9	349° 58'.9	13'.5	09'.9	8'.0	
358° 32'.2	16° 34'.2 N	4° 31'.4	13'.5	13° 01'.9 N	8'.0	54'.5
13° 32'.3	33'.5	19° 03'.9	13'.6	12° 53'.9 N	8'.0	54'.6
28° 32'.3	32'.8	33° 36'.5	13'.6	45'.9	8'.2	
43° 32'.4	32'.1	48° 09'.1	13'.6	37'.7	8'.2	
58° 32'.5	31'.4	62° 41'.7	13'.6	29'.5	8'.2	
73° 32'.5	30'.7	77° 14'.3	13'.6	21'.3	8'.3	
88° 32'.6	30'.0	91° 46'.9	13'.6	13'.0	8'.4	
103° 32'.7	29'.3	106° 19'.5	13'.7	04'.6	8'.4	
118° 32'.8	28'.6	120° 52'.2	13'.6	11° 56'.2 N	8'.5	54'.7
133° 32'.8	27'.9	135° 24'.8	13'.7	47'.7	8'.5	
148° 32'.9	27'.2	149° 57'.5	13'.7	39'.2	8'.6	
163° 33'.0	26'.5	164° 30'.2	13'.8	30'.6	8'.6	
178° 33'.1	16° 25'.8 N	179° 03'.0	13'.7	11° 22'.0 N	8'.7	54'.7
193° 33'.1	25'.1	193° 35'.7	13'.7	13'.3	8'.7	
208° 33'.2	24'.4	208° 08'.4	13'.8	04'.6	8'.8	
223° 33'.3	23'.7	222° 41'.2	13'.8	10° 55'.8 N	8'.9	
238° 33'.4	23'.0	237° 14'.0	13'.8	46'.9	8'.9	54'.8
253° 33'.4	22'.3	251° 46'.8	13'.8	38'.0	8'.9	
268° 33'.5	21'.6	266° 19'.6	13'.8	29'.1	9'.0	
283° 33'.6	20'.9	280° 52'.4	13'.8	20'.1	9'.1	
298° 33'.7	20'.2	295° 25'.2	13'.8	11'.0	9'.1	
313° 33'.7	19'.5	309° 58'.0	13'.9	01'.9	9'.1	
328° 33'.8	18'.8	324° 30'.9	13'.9	9° 52'.8 N	9'.2	54'.9
343° 33'.9	18'.1	339° 03'.8	13'.8	43'.6	9'.3	
358° 34'.0	16° 17'.4 N	353° 36'.6	13'.9	9° 34'.3 N	9'.3	54'.9
13° 34'.0	16'.7	8° 09'.5	13'.9	25'.0	9'.3	
28° 34'.1	16'.0	22° 42'.4	13'.9	15'.7	9'.4	
43° 34'.2	15'.3	37° 15'.3	13'.9	06'.3	9'.4	
58° 34'.3	14'.6	51° 48'.2	14'.0	8° 56'.9 N	9'.5	
73° 34'.4	13'.9	66° 21'.2	13'.9	47'.4	9'.5	55'.0
88° 34'.4	13'.2	80° 54'.1	13'.9	37'.9	9'.5	
103° 34'.5	12'.5	95° 27'.0	14'.0	28'.4	9'.6	
118° 34'.6	11'.8	110° 00'.0	14'.0	18'.8	9'.7	
133° 34'.7	11'.1	124° 33'.0	13'.9	09'.1	9'.6	
148° 34'.8	10'.4	139° 05'.9	14'.0	7° 59'.5 N	9'.8	
163° 34'.8	09'.7	153° 38'.9	14'.0	49'.7	9'.7	55'.1
SD 15'.8	d 0'.7	SD	14'.8	14'.9	15'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 5	Moonrise 6	Moonrise 7
N 72°	-	-	01:00	-	01:59	03:48
N 70°	-	-	02:05	00:50	02:29	04:07
68°	-	-	02:40	01:23	02:51	04:21
66°	-	01:24	03:05	01:47	03:09	04:33
64°	-	02:07	03:24	02:06	03:23	04:42
62°	-	02:35	03:40	02:21	03:34	04:51
60°	01:16	02:56	03:53	02:34	03:44	04:58
N 58°	01:55	03:13	04:04	02:45	03:53	05:04
56°	02:21	03:27	04:14	02:55	04:01	05:09
54°	02:40	03:39	04:22	03:03	04:08	05:14
52°	02:56	03:50	04:30	03:11	04:14	05:19
50°	03:10	03:59	04:37	03:18	04:19	05:23
45°	03:37	04:18	04:51	03:32	04:31	05:31
N 40°	03:57	04:33	05:03	03:44	04:41	05:39
35°	04:13	04:46	05:13	03:54	04:49	05:45
30°	04:26	04:56	05:22	04:03	04:56	05:50
20°	04:46	05:14	05:37	04:19	05:09	06:00
N 10°	05:02	05:28	05:50	04:32	05:20	06:08
0°	05:16	05:41	06:02	04:44	05:30	06:16
S 10°	05:27	05:53	06:14	04:57	05:41	06:23
20°	05:38	06:04	06:27	05:10	05:52	06:31
30°	05:48	06:17	06:42	05:25	06:04	06:41
35°	05:53	06:23	06:50	05:34	06:11	06:46
40°	05:58	06:31	06:59	05:44	06:19	06:52
45°	06:04	06:39	07:10	05:56	06:29	06:59
S 50°	06:10	06:49	07:23	06:10	06:40	07:07
52°	06:13	06:53	07:30	06:17	06:46	07:11
54°	06:16	06:58	07:36	06:24	06:52	07:16
56°	06:18	07:03	07:44	06:32	06:58	07:20
58°	06:22	07:09	07:53	06:41	07:05	07:25
S 60°	06:25	07:15	08:02	06:52	07:14	07:31
S 62°	06:29	07:23	08:14	07:04	07:23	07:38

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 5	Moonset 6	Moonset 7
N 72°	22:59	-	-	20:52	20:37	20:25
N 70°	22:01	-	-	20:21	20:17	20:13
68°	21:28	-	-	19:58	20:01	20:04
66°	21:04	22:40	-	19:39	19:49	19:56
64°	20:45	22:00	-	19:25	19:38	19:49
62°	20:30	21:34	-	19:12	19:29	19:43
60°	20:17	21:13	22:49	19:02	19:21	19:38
N 58°	20:06	20:57	22:13	18:52	19:14	19:33
56°	19:57	20:43	21:48	18:44	19:08	19:29
54°	19:48	20:31	21:29	18:37	19:03	19:25
52°	19:41	20:21	21:13	18:30	18:58	19:22
50°	19:34	20:12	21:00	18:24	18:53	19:19
45°	19:20	19:53	20:34	18:12	18:43	19:12
N 40°	19:08	19:38	20:14	18:01	18:35	19:07
35°	18:58	19:25	19:58	17:52	18:28	19:02
30°	18:49	19:15	19:45	17:44	18:22	18:57
20°	18:34	18:58	19:25	17:30	18:11	18:50
N 10°	18:21	18:43	19:09	17:18	18:01	18:43
0°	18:09	18:31	18:56	17:07	17:52	18:37
S 10°	17:57	18:19	18:45	16:55	17:43	18:31
20°	17:45	18:08	18:34	16:43	17:33	18:24
30°	17:30	17:55	18:24	16:29	17:22	18:16
35°	17:22	17:49	18:19	16:21	17:16	18:12
40°	17:13	17:41	18:14	16:11	17:08	18:07
45°	17:02	17:33	18:08	16:00	17:00	18:01
S 50°	16:49	17:24	18:02	15:47	16:49	17:54
52°	16:43	17:19	18:00	15:41	16:45	17:50
54°	16:36	17:14	17:57	15:34	16:39	17:47
56°	16:28	17:09	17:54	15:26	16:33	17:43
58°	16:20	17:03	17:51	15:17	16:27	17:38
S 60°	16:10	16:57	17:48	15:07	16:19	17:33
S 62°	15:59	16:50	17:44	14:55	16:10	17:27

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
5	6 01	5 58	12:06	10:56	23:19	28d 2%
6	5 55	5 51	12:06	11:41	24:04	29d 0%
7	5 48	5 44	12:06	12:26	00:04	1d 1%

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2013 August 8, 9, 10 (Thur, Fri, Sat)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
8 Thursday 00	316° 40'.0	145° 40'.9	5° 05'.0 N	208° 09'.9	23° 07'.3 N	216° 24'.6	22° 56'.7 N	102° 35'.5	11° 10'.4 S
01	331° 42'.5	160° 40'.6	03'.7	223° 10'.6	07'.2	231° 26'.5	56'.7	117° 37'.8	10'.4
02	346° 45'.0	175° 40'.4	02'.5	238° 11'.3	07'.0	246° 28'.4	56'.6	132° 40'.2	10'.5
03	1° 47'.4	190° 40'.1	01'.2	253° 12'.0	06'.8	261° 30'.3	56'.6	147° 42'.5	10'.5
04	16° 49'.9	205° 39'.9	00'.0	268° 12'.6	06'.6	276° 32'.2	56'.6	162° 44'.9	10'.6
05	31° 52'.4	220° 39'.6	4° 58'.7 N	283° 13'.3	06'.4	291° 34'.1	56'.5	177° 47'.2	10'.6
06	46° 54'.8	235° 39'.4	57'.4	298° 14'.0	06'.2	306° 36'.0	56'.5	192° 49'.6	10'.7
07	61° 57'.3	250° 39'.1	56'.2	313° 14'.7	06'.1	321° 38'.0	56'.5	207° 51'.9	10'.7
08	76° 59'.7	265° 38'.9	54'.9	328° 15'.4	05'.9	336° 39'.9	56'.4	222° 54'.3	10'.8
09	92° 02'.2	280° 38'.6	53'.7	343° 16'.1	05'.7	351° 41'.8	56'.4	237° 56'.6	10'.8
10	107° 04'.7	295° 38'.4	52'.4	358° 16'.8	05'.5	6° 43'.7	56'.4	252° 59'.0	10'.9
11	122° 07'.1	310° 38'.1	51'.2	13° 17'.5	05'.3	21° 45'.6	56'.3	268° 01'.3	10'.9
12	137° 09'.6	325° 37'.9	4° 49'.9 N	28° 18'.2	23° 05'.1 N	36° 47'.5	22° 56'.3 N	283° 03'.7	11° 11'.0 S
13	152° 12'.1	340° 37'.7	48'.6	43° 18'.9	04'.9	51° 49'.4	56'.3	298° 06'.0	11'.0
14	167° 14'.5	355° 37'.4	47'.4	58° 19'.6	04'.8	66° 51'.3	56'.2	313° 08'.3	11'.1
15	182° 17'.0	10° 37'.2	46'.1	73° 20'.3	04'.6	81° 53'.2	56'.2	328° 10'.7	11'.1
16	197° 19'.5	25° 36'.9	44'.9	88° 20'.9	04'.4	96° 55'.2	56'.2	343° 13'.0	11'.2
17	212° 21'.9	40° 36'.7	43'.6	103° 21'.6	04'.2	111° 57'.1	56'.1	358° 15'.4	11'.2
18	227° 24'.4	55° 36'.4	42'.3	118° 22'.3	04'.0	126° 59'.0	56'.1	13° 17'.7	11'.3
19	242° 26'.9	70° 36'.2	41'.1	133° 23'.0	03'.8	142° 00'.9	56'.1	28° 20'.1	11'.3
20	257° 29'.3	85° 35'.9	39'.8	148° 23'.7	03'.6	157° 02'.8	56'.0	43° 22'.4	11'.4
21	272° 31'.8	100° 35'.7	38'.5	163° 24'.4	03'.4	172° 04'.7	56'.0	58° 24'.8	11'.4
22	287° 34'.2	115° 35'.5	37'.3	178° 25'.1	03'.2	187° 06'.6	56'.0	73° 27'.1	11'.5
23	302° 36'.7	130° 35'.2	36'.0	193° 25'.8	03'.0	202° 08'.5	55'.9	88° 29'.5	11'.5
9 Friday 00	317° 39'.2	145° 35'.0	4° 34'.8 N	208° 26'.5	23° 02'.9 N	217° 10'.5	22° 55'.9 N	103° 31'.8	11° 11'.6 S
01	332° 41'.6	160° 34'.7	33'.5	223° 27'.2	02'.7	232° 12'.4	55'.9	118° 34'.2	11'.6
02	347° 44'.1	175° 34'.5	32'.2	238° 27'.9	02'.5	247° 14'.3	55'.9	133° 36'.5	11'.7
03	2° 46'.6	190° 34'.2	31'.0	253° 28'.6	02'.3	262° 16'.2	55'.8	148° 38'.9	11'.8
04	17° 49'.0	205° 34'.0	29'.7	268° 29'.3	02'.1	277° 18'.1	55'.8	163° 41'.2	11'.8
05	32° 51'.5	220° 33'.8	28'.4	283° 30'.0	01'.9	292° 20'.0	55'.8	178° 43'.6	11'.9
06	47° 54'.0	235° 33'.5	27'.2	298° 30'.7	01'.7	307° 21'.9	55'.7	193° 45'.9	11'.9
07	62° 56'.4	250° 33'.3	25'.9	313° 31'.4	01'.5	322° 23'.8	55'.7	208° 48'.2	12'.0
08	77° 58'.9	265° 33'.0	24'.6	328° 32'.0	01'.3	337° 25'.8	55'.6	223° 50'.6	12'.0
09	93° 01'.3	280° 32'.8	23'.4	343° 32'.7	01'.1	352° 27'.7	55'.6	238° 52'.9	12'.1
10	108° 03'.8	295° 32'.6	22'.1	358° 33'.4	00'.9	7° 29'.6	55'.6	253° 55'.3	12'.1
11	123° 06'.3	310° 32'.3	20'.9	13° 34'.1	00'.7	22° 31'.5	55'.5	268° 57'.6	12'.2
12	138° 08'.7	325° 32'.1	4° 19'.6 N	28° 34'.8	23° 00'.5 N	37° 33'.4	22° 55'.5 N	284° 00'.0	11° 12'.2 S
13	153° 11'.2	340° 31'.8	18'.3	43° 35'.5	00'.4	52° 35'.3	55'.5	299° 02'.3	12'.3
14	168° 13'.7	355° 31'.6	17'.1	58° 36'.2	00'.2	67° 37'.2	55'.4	314° 04'.7	12'.3
15	183° 16'.1	10° 31'.4	15'.8	73° 36'.9	00'.0	82° 39'.2	55'.4	329° 07'.0	12'.4
16	198° 18'.6	25° 31'.1	14'.5	88° 37'.6	22° 59'.8 N	97° 41'.1	55'.4	344° 09'.4	12'.4
17	213° 21'.1	40° 30'.9	13'.3	103° 38'.3	59'.6	112° 43'.0	55'.3	359° 11'.7	12'.5
18	228° 23'.5	55° 30'.6	12'.0	118° 39'.0	59'.4	127° 44'.9	55'.3	14° 14'.0	12'.5
19	243° 26'.0	70° 30'.4	10'.7	133° 39'.7	59'.2	142° 46'.8	55'.3	29° 16'.4	12'.6
20	258° 28'.5	85° 30'.2	09'.5	148° 40'.4	59'.0	157° 48'.7	55'.2	44° 18'.7	12'.6
21	273° 30'.9	100° 29'.9	08'.2	163° 41'.1	58'.8	172° 50'.7	55'.2	59° 21'.1	12'.7
22	288° 33'.4	115° 29'.7	06'.9	178° 41'.8	58'.6	187° 52'.6	55'.2	74° 23'.4	12'.7
23	303° 35'.8	130° 29'.5	05'.7	193° 42'.5	58'.4	202° 54'.5	55'.1	89° 25'.8	12'.8
10 Saturday 00	318° 38'.3	145° 29'.2	4° 04'.4 N	208° 43'.2	22° 58'.2 N	217° 56'.4	22° 55'.1 N	104° 28'.1	11° 12'.8 S
01	333° 40'.8	160° 29'.0	03'.1	223° 43'.9	58'.0	232° 58'.3	55'.1	119° 30'.4	12'.9
02	348° 43'.2	175° 28'.8	01'.9	238° 44'.6	57'.8	248° 00'.2	55'.0	134° 32'.8	12'.9
03	3° 45'.7	190° 28'.5	00'.6	253° 45'.3	57'.6	263° 02'.1	55'.0	149° 35'.1	13'.0
04	18° 48'.2	205° 28'.3	3° 59'.3 N	268° 46'.0	57'.4	278° 04'.1	55'.0	164° 37'.5	13'.0
05	33° 50'.6	220° 28'.0	58'.1	283° 46'.7	57'.2	293° 06'.0	54'.9	179° 39'.8	13'.1
06	48° 53'.1	235° 27'.8	56'.8	298° 47'.4	57'.0	308° 07'.9	54'.9	194° 42'.2	13'.2
07	63° 55'.6	250° 27'.6	55'.5	313° 48'.1	56'.8	323° 09'.8	54'.9	209° 44'.5	13'.2
08	78° 58'.0	265° 27'.3	54'.2	328° 48'.8	56'.6	338° 11'.7	54'.8	224° 46'.8	13'.3
09	94° 00'.5	280° 27'.1	53'.0	343° 49'.5	56'.4	353° 13'.6	54'.8	239° 49'.2	13'.3
10	109° 03'.0	295° 26'.9	51'.7	358° 50'.2	56'.2	8° 15'.6	54'.8	254° 51'.5	13'.4
11	124° 05'.4	310° 26'.6	50'.4	13° 50'.9	56'.0	23° 17'.5	54'.7	269° 53'.9	13'.4
12	139° 07'.9	325° 26'.4	3° 49'.2 N	28° 51'.6	22° 55'.8 N	38° 19'.4	22° 54'.7 N	284° 56'.2	11° 13'.5 S
13	154° 10'.3	340° 26'.2	47'.9	43° 52'.3	55'.6	53° 21'.3	54'.7	299° 58'.6	13'.5
14	169° 12'.8	355° 25'.9	46'.6	58° 53'.0	55'.4	68° 23'.2	54'.6	315° 00'.9	13'.6
15	184° 15'.3	10° 25'.7	45'.4	73° 53'.7	55'.2	83° 25'.1	54'.6	330° 03'.2	13'.6
16	199° 17'.7	25° 25'.5	44'.1	88° 54'.4	55'.0	98° 27'.1	54'.6	345° 05'.6	13'.7
17	214° 20'.2	40° 25'.2	42'.8	103° 55'.1	54'.8	113° 29'.0	54'.5	0° 07'.9	13'.7
18	229° 22'.7	55° 25'.0	41'.5	118° 55'.8	54'.6	128° 30'.9	54'.5	15° 10'.3	13'.8
19	244° 25'.1	70° 24'.8	40'.3	133° 56'.5	54'.4	143° 32'.8	54'.5	30° 12'.6	13'.8
20	259° 27'.6	85° 24'.5	39'.0	148° 57'.2	54'.2	158° 34'.7	54'.4	45° 14'.9	13'.9
21	274° 30'.1	100° 24'.3	37'.7	163° 57'.9	54'.0	173° 36'.7	54'.4	60° 17'.3	13'.9
22	289° 32'.5	115° 24'.1	36'.5	178° 58'.6	53'.8	188° 38'.6	54'.4	75° 19'.6	14'.0
23	304° 35'.0	130° 23'.8	35'.2	193° 59'.3	53'.6	203° 40'.5	54'.3	90° 22'.0	14'.1
	M.P. 02:45	v -0'.2	d 1'.3	v 0'.7	d 0'.2	v 1'.9	d 0'.0	v 2'.3	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.3	40° 14'.8 S
Achernar	335° 26'.5	57° 09'.7 S
Acrux	173° 09'.5	63° 10'.7 S
Adhara	255° 12'.7	28° 59'.4 S
Aldebaran	290° 49'.4	16° 32'.1 N
Alioth	166° 20'.9	55° 53'.4 N
Alkaid	152° 59'.0	49° 15'.0 N
Alnair	27° 43'.1	46° 53'.4 S
Alnilam	275° 46'.4	1° 11'.7 S
Alphard	217° 56'.3	8° 43'.1 S
Alphecca	126° 10'.9	26° 40'.4 N
Alpheratz	357° 43'.1	29° 10'.0 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.3	42° 13'.6 S
Antares	112° 25'.9	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.9 N
Atria	107° 27'.3	69° 03'.2 S
Avior	234° 18'.6	59° 33'.3 S
Bellatrix	278° 32'.1	6° 21'.6 N
Betelgeuse	271° 01'.4	7° 24'.5 N
Canopus	263° 56'.5	52° 42'.1 S
Capella	280° 34'.5	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.0 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.6	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.7 N
Elnath	278° 12'.7	28° 36'.9 N
Eltanin	90° 45'.7	51° 29'.6 N
Enif	33° 46'.7	9° 56'.5 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.0	57° 11'.6 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.8	60° 26'.5 S
Hamal	328° 00'.5	23° 31'.5 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 20'.2	74° 06'.3 N
Markab	13° 37'.9	15° 16'.9 N
Menkar	314° 14'.9	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.5 S
Mirfak	308° 40'.2	49° 54'.3 N
Nunki	75° 57'.8	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 41'.1	89° 19'.0 N
Pollux	243° 27'.9	27° 59'.4 N
Procyon	244° 59'.9	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.1	8° 11'.2 S
Rigil Kent	139° 51'.5	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 40'.0	56° 36'.6 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 33'.9	16° 44'.1 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.4 S
Vega	80° 38'.5	38° 48'.1 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	187° 55'.8	14:18
Mars	250° 47'.3	10:06
Jupiter	259° 31'.3	09:30
Saturn	145° 52'.6	17:03

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
178° 34'.9	16° 08'.9 N	168° 11'.9	13'.9	7° 40'.0 N	9'.8	55'.1
193° 35'.0	08'.2	182° 44'.8	14'.0	30'.2	9'.8	
208° 35'.1	07'.5	197° 17'.8	14'.0	20'.4	9'.9	
223° 35'.2	06'.8	211° 50'.8	14'.0	10'.5	9'.9	
238° 35'.2	06'.1	226° 23'.8	14'.0	00'.6	10'.0	
253° 35'.3	05'.4	240° 56'.8	14'.0	6° 50'.6 N	9'.9	55'.2
268° 35'.4	04'.7	255° 29'.8	14'.0	40'.7	10'.0	
283° 35'.5	04'.0	270° 02'.8	14'.1	30'.7	10'.1	
298° 35'.6	03'.3	284° 35'.9	14'.0	20'.6	10'.1	
313° 35'.6	02'.5	299° 08'.9	14'.0	10'.5	10'.1	
328° 35'.7	01'.8	313° 41'.9	14'.0	00'.4	10'.1	
343° 35'.8	01'.1	328° 14'.9	14'.0	5° 50'.3 N	10'.2	55'.3
358° 35'.9	16° 00'.4 N	342° 47'.9	14'.0	5° 40'.1 N	10'.2	55'.3
13° 36'.0	15° 59'.7 N	357° 20'.9	14'.0	29'.9	10'.2	
28° 36'.1	59'.0	11° 53'.9	14'.0	19'.7	10'.3	
43° 36'.1	58'.3	26° 26'.9	14'.1	09'.4	10'.3	
58° 36'.2	57'.5	41° 00'.0	14'.0	4° 59'.1 N	10'.3	55'.4
73° 36'.3	56'.8	55° 33'.0	14'.0	48'.8	10'.4	
88° 36'.4	56'.1	70° 06'.0	14'.0	38'.4	10'.3	
103° 36'.5	55'.4	84° 39'.0	14'.0	28'.1	10'.4	
118° 36'.6	54'.7	99° 12'.0	14'.0	17'.7	10'.4	
133° 36'.7	54'.0	113° 45'.0	13'.9	07'.3	10'.5	
148° 36'.7	53'.2	128° 17'.9	14'.0	3° 56'.8 N	10'.5	55'.5
163° 36'.8	52'.5	142° 50'.9	14'.0	46'.3	10'.5	
178° 36'.9	15° 51'.8 N	157° 23'.9	14'.0	3° 35'.8 N	10'.5	55'.5
193° 37'.0	51'.1	171° 56'.9	13'.9	25'.3	10'.5	
208° 37'.1	50'.4	186° 29'.8	14'.0	14'.8	10'.6	
223° 37'.2	49'.6	201° 02'.8	13'.9	04'.2	10'.5	55'.6
238° 37'.3	48'.9	215° 35'.7	14'.0	2° 53'.7 N	10'.6	
253° 37'.4	48'.2	230° 08'.7	13'.9	43'.1	10'.6	
268° 37'.4	47'.5	244° 41'.6	13'.9	32'.5	10'.7	
283° 37'.5	46'.7	259° 14'.5	13'.9	21'.8	10'.6	
298° 37'.6	46'.0	273° 47'.4	13'.9	11'.2	10'.7	55'.7
313° 37'.7	45'.3	288° 20'.3	13'.9	00'.5	10'.7	
328° 37'.8	44'.6	302° 53'.2	13'.8	1° 49'.8 N	10'.7	
343° 37'.9	43'.8	317° 26'.0	13'.9	39'.1	10'.7	
358° 38'.0	15° 43'.1 N	331° 58'.9	13'.8	1° 28'.4 N	10'.7	55'.7
13° 38'.1	42'.4	346° 31'.7	13'.8	17'.7	10'.7	55'.8
28° 38'.2	41'.7	1° 04'.5	13'.8	07'.0	10'.8	
43° 38'.2	40'.9	15° 37'.3	13'.8	0° 56'.2 N	10'.7	
58° 38'.3	40'.2	30° 10'.1	13'.8	45'.5	10'.8	
73° 38'.4	39'.5	44° 42'.9	13'.7	34'.7	10'.8	
88° 38'.5	38'.8	59° 15'.6	13'.8	23'.9	10'.8	55'.9
103° 38'.6	38'.0	73° 48'.4	13'.7	13'.1	10'.7	
118° 38'.7	37'.3	88° 21'.1	13'.7	02'.4	10'.8	
133° 38'.8	36'.6	102° 53'.8	13'.7	0° 08'.4 S	10'.8	
148° 38'.9	35'.8	117° 26'.5	13'.6	19'.2	10'.9	
163° 39'.0	35'.1	131° 59'.1	13'.7	30'.1	10'.8	56'.0
178° 39'.1	15° 34'.4 N	146° 31'.8	13'.6	0° 40'.9 S	10'.8	56'.0
193° 39'.2	33'.7	161° 04'.4	13'.6	51'.7	10'.8	
208° 39'.3	32'.9	175° 37'.0	13'.5	1° 02'.5 S	10'.8	
223° 39'.3	32'.2	190° 09'.5	13'.6	13'.3	10'.9	
238° 39'.4	31'.5	204° 42'.1	13'.5	24'.2	10'.8	56'.1
253° 39'.5	30'.7	219° 14'.6	13'.5	35'.0	10'.8	
268° 39'.6	30'.0	233° 47'.1	13'.4	45'.8	10'.8	
283° 39'.7	29'.3	248° 19'.5	13'.5	56'.6	10'.9	
298° 39'.8	28'.5	262° 52'.0	13'.4	2° 07'.5 S	10'.8	
313° 39'.9	27'.8	277° 24'.4	13'.3	18'.3	10'.8	56'.2
328° 40'.0	27'.1	291° 56'.7	13'.4	29'.1	10'.8	
343° 40'.1	26'.3	306° 29'.1	13'.3	39'.9	10'.8	
358° 40'.2	15° 25'.6 N	321° 01'.4	13'.3	2° 50'.7 S	10'.8	56'.2
13° 40'.3	24'.9	335° 33'.7	13'.3	3° 01'.5 S	10'.8	56'.3
28° 40'.4	24'.1	350° 06'.0	13'.2	12'.3	10'.8	
43° 40'.5	23'.4	4° 38'.2	13'.2	23'.1	10'.8	
58° 40'.6	22'.6	19° 10'.4	13'.1	33'.9	10'.8	
73° 40'.7	21'.9	33° 42'.5	13'.1	44'.7	10'.7	
88° 40'.8	21'.2	48° 14'.6	13'.1	55'.4	10'.8	56'.4
103° 40'.9	20'.4	62° 46'.7	13'.1	4° 06'.2 S	10'.7	
118° 41'.0	19'.7	77° 18'.8	13'.0	16'.9	10'.7	
133° 41'.1	18'.9	91° 50'.8	13'.0	27'.6	10'.7	
148° 41'.2	18'.2	106° 22'.8	12'.9	38'.3	10'.7	56'.5
163° 41'.3	17'.5	120° 54'.7	12'.9	49'.0	10'.7	
SD 15'.8	d 0'.7	SD	15'.1	15'.2	15'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 8	Moonrise 9	Moonrise 10
N 72°	-	-	01:36	05:33	07:16	09:00
N 70°	-	-	02:24	05:43	07:19	08:57
68°	-	00:32	02:54	05:51	07:22	08:54
66°	-	01:47	03:16	05:58	07:24	08:52
64°	-	02:21	03:34	06:04	07:26	08:50
62°	00:29	02:46	03:48	06:08	07:28	08:48
60°	01:36	03:05	04:00	06:13	07:29	08:47
N 58°	02:07	03:21	04:10	06:16	07:30	08:45
56°	02:30	03:34	04:19	06:20	07:31	08:44
54°	02:48	03:45	04:27	06:23	07:32	08:43
52°	03:03	03:55	04:34	06:25	07:33	08:42
50°	03:16	04:04	04:41	06:28	07:34	08:41
45°	03:41	04:22	04:55	06:33	07:36	08:39
N 40°	04:00	04:36	05:06	06:37	07:37	08:38
35°	04:15	04:48	05:15	06:41	07:38	08:36
30°	04:28	04:58	05:24	06:45	07:40	08:35
20°	04:48	05:15	05:38	06:50	07:41	08:33
N 10°	05:03	05:29	05:51	06:55	07:43	08:32
0°	05:16	05:41	06:02	07:00	07:45	08:30
S 10°	05:26	05:52	06:13	07:05	07:46	08:28
20°	05:36	06:03	06:25	07:10	07:48	08:27
30°	05:46	06:14	06:39	07:16	07:50	08:25
35°	05:50	06:20	06:47	07:19	07:51	08:24
40°	05:55	06:27	06:56	07:23	07:53	08:22
45°	06:00	06:35	07:06	07:27	07:54	08:21
S 50°	06:06	06:44	07:18	07:32	07:56	08:19
52°	06:08	06:48	07:24	07:35	07:57	08:19
54°	06:10	06:53	07:31	07:37	07:58	08:18
56°	06:13	06:57	07:38	07:40	07:59	08:17
58°	06:16	07:03	07:46	07:43	08:00	08:16
S 60°	06:19	07:09	07:55	07:47	08:01	08:15
S 62°	06:22	07:15	08:05	07:51	08:02	08:14

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 8	Moonset 9	Moonset 10
N 72°	22:26	-	-	20:15	20:06	19:56
N 70°	21:42	-	-	20:10	20:06	20:02
68°	21:14	23:19	-	20:05	20:06	20:07
66°	20:52	22:19	-	20:01	20:06	20:11
64°	20:35	21:46	-	19:58	20:06	20:14
62°	20:21	21:22	23:25	19:55	20:06	20:17
60°	20:09	21:03	22:30	19:52	20:06	20:20
N 58°	19:59	20:48	22:00	19:50	20:06	20:23
56°	19:50	20:35	21:38	19:48	20:06	20:25
54°	19:42	20:24	21:20	19:46	20:06	20:27
52°	19:35	20:15	21:06	19:44	20:06	20:28
50°	19:29	20:06	20:53	19:43	20:06	20:30
45°	19:16	19:48	20:29	19:39	20:06	20:34
N 40°	19:04	19:34	20:10	19:37	20:06	20:36
35°	18:55	19:22	19:55	19:34	20:06	20:39
30°	18:47	19:12	19:42	19:32	20:06	20:41
20°	18:33	18:56	19:23	19:28	20:06	20:45
N 10°	18:20	18:42	19:08	19:25	20:06	20:49
0°	18:09	18:30	18:55	19:22	20:06	20:52
S 10°	17:58	18:19	18:45	19:18	20:06	20:55
20°	17:46	18:09	18:35	19:15	20:06	20:59
30°	17:32	17:57	18:26	19:11	20:06	21:02
35°	17:24	17:51	18:21	19:09	20:06	21:05
40°	17:16	17:44	18:16	19:06	20:06	21:07
45°	17:05	17:36	18:11	19:03	20:06	21:10
S 50°	16:53	17:27	18:06	18:59	20:06	21:14
52°	16:47	17:23	18:04	18:58	20:06	21:15
54°	16:41	17:19	18:01	18:56	20:06	21:17
56°	16:34	17:14	17:59	18:54	20:06	21:19
58°	16:26	17:09	17:56	18:51	20:06	21:21
S 60°	16:17	17:03	17:53	18:49	20:06	21:24
S 62°	16:07	16:57	17:50	18:46	20:06	21:27

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
8	5 41	5 37	12:06	13:11	00:49	2d 3%
9	5 33	5 28	12:05	13:56	01:33	3d 7%
10	5 24	5 19	12:05	14:41	02:18	4d 13%

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2013 August 11, 12, 13 (Sun, Mon, Tue)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
11 Sunday 00	319° 37'.4	145° 23'.6	3° 33'.9 N	209° 00'.0	22° 53'.4 N	218° 42'.4	22° 54'.3 N	105° 24'.3	11° 14'.1 S
01	334° 39'.9	160° 23'.4	32'.6	224° 00'.7	53'.1	233° 44'.3	54'.3	120° 26'.6	14'.2
02	349° 42'.4	175° 23'.2	31'.4	239° 01'.4	52'.9	248° 46'.2	54'.2	135° 29'.0	14'.2
03	4° 44'.8	190° 22'.9	30'.1	254° 02'.1	52'.7	263° 48'.2	54'.2	150° 31'.3	14'.3
04	19° 47'.3	205° 22'.7	28'.8	269° 02'.8	52'.5	278° 50'.1	54'.2	165° 33'.7	14'.3
05	34° 49'.8	220° 22'.5	27'.6	284° 03'.5	52'.3	293° 52'.0	54'.1	180° 36'.0	14'.4
06	49° 52'.2	235° 22'.2	26'.3	299° 04'.2	52'.1	308° 53'.9	54'.1	195° 38'.3	14'.4
07	64° 54'.7	250° 22'.0	25'.0	314° 04'.9	51'.9	323° 55'.8	54'.1	210° 40'.7	14'.5
08	79° 57'.2	265° 21'.8	23'.7	329° 05'.6	51'.7	338° 57'.8	54'.0	225° 43'.0	14'.5
09	94° 59'.6	280° 21'.6	22'.5	344° 06'.3	51'.5	353° 59'.7	54'.0	240° 45'.3	14'.6
10	110° 02'.1	295° 21'.3	21'.2	359° 07'.0	51'.3	9° 01'.6	53'.9	255° 47'.7	14'.6
11	125° 04'.6	310° 21'.1	19'.9	14° 07'.7	51'.1	24° 03'.5	53'.9	270° 50'.0	14'.7
12	140° 07'.0	325° 20'.9	3° 18'.6 N	29° 08'.4	22° 50'.9 N	39° 05'.4	22° 53'.9 N	285° 52'.4	11° 14'.8 S
13	155° 09'.5	340° 20'.6	17'.4	44° 09'.1	50'.7	54° 07'.4	53'.8	300° 54'.7	14'.8
14	170° 11'.9	355° 20'.4	16'.1	59° 09'.8	50'.5	69° 09'.3	53'.8	315° 57'.0	14'.9
15	185° 14'.4	10° 20'.2	14'.8	74° 10'.6	50'.2	84° 11'.2	53'.8	330° 59'.4	14'.9
16	200° 16'.9	25° 20'.0	13'.6	89° 11'.3	50'.0	99° 13'.1	53'.7	346° 01'.7	15'.0
17	215° 19'.3	40° 19'.7	12'.3	104° 12'.0	49'.8	114° 15'.0	53'.7	1° 04'.1	15'.0
18	230° 21'.8	55° 19'.5	11'.0	119° 12'.7	49'.6	129° 17'.0	53'.7	16° 06'.4	15'.1
19	245° 24'.3	70° 19'.3	09'.7	134° 13'.4	49'.4	144° 18'.9	53'.6	31° 08'.7	15'.1
20	260° 26'.7	85° 19'.0	08'.5	149° 14'.1	49'.2	159° 20'.8	53'.6	46° 11'.1	15'.2
21	275° 29'.2	100° 18'.8	07'.2	164° 14'.8	49'.0	174° 22'.7	53'.6	61° 13'.4	15'.2
22	290° 31'.7	115° 18'.6	05'.9	179° 15'.5	48'.8	189° 24'.7	53'.5	76° 15'.7	15'.3
23	305° 34'.1	130° 18'.4	04'.6	194° 16'.2	48'.6	204° 26'.6	53'.5	91° 18'.1	15'.3
12 Monday 00	320° 36'.6	145° 18'.1	3° 03'.4 N	209° 16'.9	22° 48'.3 N	219° 28'.5	22° 53'.5 N	106° 20'.4	11° 15'.4 S
01	335° 39'.0	160° 17'.9	02'.1	224° 17'.6	48'.1	234° 30'.4	53'.4	121° 22'.7	15'.5
02	350° 41'.5	175° 17'.7	00'.8	239° 18'.3	47'.9	249° 32'.3	53'.4	136° 25'.1	15'.5
03	5° 44'.0	190° 17'.5	2° 59'.5 N	254° 19'.0	47'.7	264° 34'.3	53'.4	151° 27'.4	15'.6
04	20° 46'.4	205° 17'.2	58'.2	269° 19'.7	47'.5	279° 36'.2	53'.3	166° 29'.8	15'.6
05	35° 48'.9	220° 17'.0	57'.0	284° 20'.4	47'.3	294° 38'.1	53'.3	181° 32'.1	15'.7
06	50° 51'.4	235° 16'.8	55'.7	299° 21'.2	47'.1	309° 40'.0	53'.3	196° 34'.4	15'.7
07	65° 53'.8	250° 16'.6	54'.4	314° 21'.9	46'.8	324° 42'.0	53'.2	211° 36'.8	15'.8
08	80° 56'.3	265° 16'.3	53'.1	329° 22'.6	46'.6	339° 43'.9	53'.2	226° 39'.1	15'.8
09	95° 58'.8	280° 16'.1	51'.9	344° 23'.3	46'.4	354° 45'.8	53'.1	241° 41'.4	15'.9
10	111° 01'.2	295° 15'.9	50'.6	359° 24'.0	46'.2	9° 47'.7	53'.1	256° 43'.8	16'.0
11	126° 03'.7	310° 15'.7	49'.3	14° 24'.7	46'.0	24° 49'.6	53'.1	271° 46'.1	16'.0
12	141° 06'.2	325° 15'.5	2° 48'.0 N	29° 25'.4	22° 45'.8 N	39° 51'.6	22° 53'.0 N	286° 48'.4	11° 16'.1 S
13	156° 08'.6	340° 15'.2	46'.8	44° 26'.1	45'.6	54° 53'.5	53'.0	301° 50'.8	16'.1
14	171° 11'.1	355° 15'.0	45'.5	59° 26'.8	45'.3	69° 55'.4	53'.0	316° 53'.1	16'.2
15	186° 13'.5	10° 14'.8	44'.2	74° 27'.5	45'.1	84° 57'.3	52'.9	331° 55'.4	16'.2
16	201° 16'.0	25° 14'.6	42'.9	89° 28'.2	44'.9	99° 59'.3	52'.9	346° 57'.8	16'.3
17	216° 18'.5	40° 14'.3	41'.6	104° 28'.9	44'.7	115° 01'.2	52'.9	2° 00'.1	16'.3
18	231° 20'.9	55° 14'.1	40'.4	119° 29'.7	44'.5	130° 03'.1	52'.8	17° 02'.4	16'.4
19	246° 23'.4	70° 13'.9	39'.1	134° 30'.4	44'.2	145° 05'.0	52'.8	32° 04'.8	16'.4
20	261° 25'.9	85° 13'.7	37'.8	149° 31'.1	44'.0	160° 07'.0	52'.8	47° 07'.1	16'.5
21	276° 28'.3	100° 13'.5	36'.5	164° 31'.8	43'.8	175° 08'.9	52'.7	62° 09'.4	16'.6
22	291° 30'.8	115° 13'.2	35'.3	179° 32'.5	43'.6	190° 10'.8	52'.7	77° 11'.8	16'.6
23	306° 33'.3	130° 13'.0	34'.0	194° 33'.2	43'.4	205° 12'.7	52'.7	92° 14'.1	16'.7
13 Tuesday 00	321° 35'.7	145° 12'.8	2° 32'.7 N	209° 33'.9	22° 43'.2 N	220° 14'.7	22° 52'.6 N	107° 16'.4	11° 16'.7 S
01	336° 38'.2	160° 12'.6	31'.4	224° 34'.6	42'.9	235° 16'.6	52'.6	122° 18'.8	16'.8
02	351° 40'.7	175° 12'.4	30'.1	239° 35'.3	42'.7	250° 18'.5	52'.5	137° 21'.1	16'.8
03	6° 43'.1	190° 12'.1	28'.9	254° 36'.1	42'.5	265° 20'.4	52'.5	152° 23'.4	16'.9
04	21° 45'.6	205° 11'.9	27'.6	269° 36'.8	42'.3	280° 22'.4	52'.5	167° 25'.8	16'.9
05	36° 48'.0	220° 11'.7	26'.3	284° 37'.5	42'.1	295° 24'.3	52'.4	182° 28'.1	17'.0
06	51° 50'.5	235° 11'.5	25'.0	299° 38'.2	41'.8	310° 26'.2	52'.4	197° 30'.4	17'.1
07	66° 53'.0	250° 11'.3	23'.7	314° 38'.9	41'.6	325° 28'.1	52'.4	212° 32'.8	17'.1
08	81° 55'.4	265° 11'.0	22'.5	329° 39'.6	41'.4	340° 30'.1	52'.3	227° 35'.1	17'.2
09	96° 57'.9	280° 10'.8	21'.2	344° 40'.3	41'.2	355° 32'.0	52'.3	242° 37'.4	17'.2
10	112° 00'.4	295° 10'.6	19'.9	359° 41'.0	40'.9	10° 33'.9	52'.3	257° 39'.8	17'.3
11	127° 02'.8	310° 10'.4	18'.6	14° 41'.8	40'.7	25° 35'.8	52'.2	272° 42'.1	17'.3
12	142° 05'.3	325° 10'.2	2° 17'.3 N	29° 42'.5	22° 40'.5 N	40° 37'.8	22° 52'.2 N	287° 44'.4	11° 17'.4 S
13	157° 07'.8	340° 09'.9	16'.1	44° 43'.2	40'.3	55° 39'.7	52'.2	302° 46'.7	17'.4
14	172° 10'.2	355° 09'.7	14'.8	59° 43'.9	40'.0	70° 41'.6	52'.1	317° 49'.1	17'.5
15	187° 12'.7	10° 09'.5	13'.5	74° 44'.6	39'.8	85° 43'.6	52'.1	332° 51'.4	17'.6
16	202° 15'.1	25° 09'.3	12'.2	89° 45'.3	39'.6	100° 45'.5	52'.0	347° 53'.7	17'.6
17	217° 17'.6	40° 09'.1	10'.9	104° 46'.0	39'.4	115° 47'.4	52'.0	2° 56'.1	17'.7
18	232° 20'.1	55° 08'.9	09'.7	119° 46'.8	39'.1	130° 49'.3	52'.0	17° 58'.4	17'.7
19	247° 22'.5	70° 08'.6	08'.4	134° 47'.5	38'.9	145° 51'.3	51'.9	33° 00'.7	17'.8
20	262° 25'.0	85° 08'.4	07'.1	149° 48'.2	38'.7	160° 53'.2	51'.9	48° 03'.1	17'.8
21	277° 27'.5	100° 08'.2	05'.8	164° 48'.9	38'.5	175° 55'.1	51'.9	63° 05'.4	17'.9
22	292° 29'.9	115° 08'.0	04'.5	179° 49'.6	38'.2	190° 57'.0	51'.8	78° 07'.7	18'.0
23	307° 32'.4	130° 07'.8	03'.2	194° 50'.3	38'.0	205° 59'.0	51'.8	93° 10'.1	18'.0
	M.P. 02:33	v -0'.2	d 1'.3	v 0'.7	d 0'.2	v 1'.9	d 0'.0	v 2'.3	d 0'.1

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 18'.2	40° 14'.8 S	178° 41'.4	15° 16'.7 N	135° 26'.6	12'.9	4° 59'.7 S	10'.7	56'.5
Achernar	335° 26'.5	57° 09'.7 S	193° 41'.5	16'.0	149° 58'.5	12'.8	5° 10'.4 S	10'.6	
Acrux	173° 09'.6	63° 10'.7 S	208° 41'.6	15'.2	164° 30'.3	12'.8	21'.0	10'.7	
Adhara	255° 12'.7	28° 59'.4 S	223° 41'.7	14'.5	179° 02'.1	12'.8	31'.7	10'.6	56'.6
Aldebaran	290° 49'.3	16° 32'.1 N	238° 41'.8	13'.8	193° 33'.9	12'.7	42'.3	10'.6	
			253° 41'.9	13'.0	208° 05'.6	12'.6	52'.9	10'.5	
Alioth	166° 21'.0	55° 53'.4 N	268° 42'.0	12'.3	222° 37'.2	12'.6	6° 03'.4 S	10'.6	
Alkaid	152° 59'.0	49° 15'.0 N	283° 42'.1	11'.5	237° 08'.8	12'.6	14'.0	10'.5	56'.7
Alnair	27° 43'.1	46° 53'.4 S	298° 42'.2	10'.8	251° 40'.4	12'.5	24'.5	10'.5	
Alnilam	275° 46'.4	1° 11'.6 S	313° 42'.3	10'.0	266° 11'.9	12'.5	35'.0	10'.5	
Alphard	217° 56'.3	8° 43'.1 S	328° 42'.4	09'.3	280° 43'.4	12'.4	45'.5	10'.5	
			343° 42'.5	08'.6	295° 14'.8	12'.4	56'.0	10'.4	56'.8
Alphecca	126° 10'.9	26° 40'.4 N	358° 42'.6	15° 07'.8 N	309° 46'.2	12'.4	7° 06'.4 S	10'.4	56'.8
Alpheratz	357° 43'.1	29° 10'.0 N	13° 42'.7	07'.1	324° 17'.6	12'.3	16'.8	10'.4	
Altair	62° 07'.8	8° 54'.6 N	28° 42'.8	06'.3	338° 48'.9	12'.2	27'.2	10'.3	
Ankaa	353° 15'.3	42° 13'.6 S	43° 42'.9	05'.6	353° 20'.1	12'.2	37'.5	10'.4	56'.9
Antares	112° 26'.0	26° 27'.6 S	58° 43'.0	04'.8	7° 51'.3	12'.1	47'.9	10'.2	
			73° 43'.1	04'.1	22° 22'.4	12'.1	58'.1	10'.3	
Arcturus	145° 55'.7	19° 06'.9 N	88° 43'.2	03'.3	36° 53'.5	12'.1	8° 08'.4 S	10'.2	
Atria	107° 27'.4	69° 03'.2 S	103° 43'.3	02'.6	51° 24'.6	12'.0	18'.6	10'.2	57'.0
Avior	234° 18'.5	59° 33'.2 S	118° 43'.4	01'.8	65° 55'.6	11'.9	28'.8	10'.2	
Bellatrix	278° 32'.0	6° 21'.6 N	133° 43'.5	01'.1	80° 26'.5	11'.9	39'.0	10'.1	
Betelgeuse	271° 01'.4	7° 24'.5 N	148° 43'.6	00'.3	94° 57'.4	11'.8	49'.1	10'.1	
			163° 43'.7	14° 59'.6 N	109° 28'.2	11'.8	59'.2	10'.0	
Canopus	263° 56'.5	52° 42'.1 S	178° 43'.8	14° 58'.8 N	123° 59'.0	11'.7	9° 09'.2 S	10'.0	57'.1
Capella	280° 34'.5	46° 00'.4 N	193° 43'.9	58'.1	138° 29'.7	11'.7	19'.2	10'.0	
Deneb	49° 30'.9	45° 20'.0 N	208° 44'.0	57'.3	153° 00'.4	11'.6	29'.2	9'.9	
Denebola	182° 33'.8	14° 29'.8 N	223° 44'.1	56'.6	167° 31'.0	11'.5	39'.1	9'.9	
Diphda	348° 55'.6	17° 54'.5 S	238° 44'.2	55'.8	182° 01'.5	11'.5	49'.0	9'.9	57'.2
			253° 44'.3	55'.1	196° 32'.0	11'.5	58'.9	9'.8	
Dubhe	193° 52'.2	61° 40'.7 N	268° 44'.4	54'.3	211° 02'.5	11'.3	10° 08'.7 S	9'.7	
Elnath	278° 12'.7	28° 36'.9 N	283° 44'.5	53'.6	225° 32'.8	11'.4	18'.4	9'.8	
Eltanin	90° 45'.7	51° 29'.6 N	298° 44'.7	52'.8	240° 03'.2	11'.2	28'.2	9'.6	57'.3
Enif	33° 46'.7	9° 56'.5 N	313° 44'.8	52'.1	254° 33'.4	11'.2	37'.8	9'.6	
Fomalhaut	15° 23'.5	29° 32'.7 S	328° 44'.9	51'.3	269° 03'.6	11'.1	47'.4	9'.6	
			343° 45'.0	50'.5	283° 33'.7	11'.1	57'.0	9'.5	57'.4
Gacrux	172° 01'.1	57° 11'.6 S	358° 45'.1	14° 49'.8 N	298° 03'.8	11'.0	11° 06'.5 S	9'.5	57'.4
Gienah	175° 52'.4	17° 37'.1 S	13° 45'.2	49'.0	312° 33'.8	11'.0	16'.0	9'.4	
Hadar	148° 47'.8	60° 26'.5 S	28° 45'.3	48'.3	327° 03'.8	10'.9	25'.4	9'.4	
Hamal	328° 00'.5	23° 31'.6 N	43° 45'.4	47'.5	341° 33'.7	10'.8	34'.8	9'.3	57'.5
Kaus Aust.	83° 43'.3	34° 22'.5 S	58° 45'.5	46'.8	356° 03'.5	10'.7	44'.1	9'.3	
			73° 45'.6	46'.0	10° 33'.2	10'.7	53'.4	9'.2	
Kochab	137° 20'.2	74° 06'.3 N	88° 45'.7	45'.2	25° 02'.9	10'.7	12° 02'.6 S	9'.2	
Markab	13° 37'.9	15° 16'.9 N	103° 45'.8	44'.5	39° 32'.6	10'.5	11'.8	9'.1	57'.6
Menkar	314° 14'.9	4° 08'.6 N	118° 45'.9	43'.7	54° 02'.1	10'.5	20'.9	9'.0	
Menkent	148° 07'.5	36° 26'.3 S	133° 46'.1	43'.0	68° 31'.6	10'.4	29'.9	9'.0	
Miaplacidus	221° 40'.5	69° 46'.5 S	148° 46'.2	42'.2	83° 01'.0	10'.4	38'.9	8'.9	
			163° 46'.3	41'.5	97° 30'.4	10'.3	47'.8	8'.8	57'.7
Mirfak	308° 40'.2	49° 54'.3 N	178° 46'.4	14° 40'.7 N	111° 59'.7	10'.2	12° 56'.6 S	8'.8	57'.7
Nunki	75° 57'.9	26° 16'.6 S	193° 46'.5	39'.9	126° 28'.9	10'.2	13° 05'.4 S	8'.8	
Peacock	53° 18'.5	56° 41'.3 S	208° 46'.6	39'.2	140° 58'.1	10'.1	14'.2	8'.6	
Polaris	317° 39'.7	89° 19'.0 N	223° 46'.7	38'.4	155° 27'.2	10'.0	22'.8	8'.6	57'.8
Pollux	243° 27'.9	27° 59'.4 N	238° 46'.8	37'.6	169° 56'.2	9'.9	31'.4	8'.6	
			253° 46'.9	36'.9	184° 25'.1	9'.9	40'.0	8'.4	
Procyon	244° 59'.9	5° 11'.3 N	268° 47'.1	36'.1	198° 54'.0	9'.8	48'.4	8'.4	
Rasalhague	96° 06'.1	12° 33'.3 N	283° 47'.2	35'.4	213° 22'.8	9'.7	56'.8	8'.4	57'.9
Regulus	207° 43'.7	11° 54'.0 N	298° 47'.3	34'.6	227° 51'.5	9'.7	14° 05'.2 S	8'.2	
Rigel	281° 12'.1	8° 11'.2 S	313° 47'.4	33'.8	242° 20'.2	9'.6	13'.4	8'.2	
Rigil Kent	139° 51'.5	60° 53'.6 S	328° 47'.5	33'.1	256° 48'.8	9'.5	21'.6	8'.1	58'.0
			343° 47'.6	32'.3	271° 17'.3	9'.5	29'.7	8'.0	
Sabik	102° 12'.2	15° 44'.3 S	358° 47'.7	14° 31'.5 N	285° 45'.8	9'.4	14° 37'.7 S	8'.0	58'.0
Schedar	349° 39'.9	56° 36'.6 N	13° 47'.9	30'.8	300° 14'.2	9'.3	45'.7	7'.9	
Shaula	96° 21'.5	37° 06'.7 S	28° 48'.0	30'.0	314° 42'.5	9'.2	53'.6	7'.8	58'.1
Sirius	258° 33'.9	16° 44'.1 S	43° 48'.1	29'.2	329° 10'.7	9'.2	15° 01'.4 S	7'.7	
Spica	158° 31'.2	11° 13'.9 S	58° 48'.2	28'.5	343° 38'.9	9'.1	09'.1	7'.7	
			73° 48'.3	27'.7	358° 07'.0	9'.0	16'.8	7'.5	
Suhail	222° 52'.8	43° 29'.3 S	88° 48'.4	26'.9	12° 35'.0	9'.0	24'.3	7'.5	58'.2
Vega	80° 38'.5	38° 48'.2 N	103° 48'.5	26'.2	27° 03'.0	8'.8	31'.8	7'.4	
Zuben'ubi	137° 05'.3	16° 05'.8 S	118° 48'.7	25'.4	41° 30'.8	8'.9	39'.2	7'.3	
	SHA	Mer.Pass.	133° 48'.8	24'.6	55° 58'.7	8'.7	46'.5	7'.3	
Venus	184° 41'.6	14:19	148° 48'.9	23'.9	70° 26'.4	8'.6	53'.8	7'.1	58'.3
Mars	248° 40'.3	10:02	163° 49'.0	23'.1	84° 54'.0	8'.6	16° 00'.9 S	7'.1	
Jupiter	258° 51'.9	09:21							
Saturn	145° 43'.8	16:52	SD 15'.8	d 0'.8	SD	15'.5	15'.6	15'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 11	Moonrise 12	Moonrise 13
N 72°	-	-	02:03	10:48	12:42	14:48
N 70°	-	-	02:41	10:37	12:22	14:12
68°	-	01:18	03:07	10:28	12:06	13:47
66°	-	02:05	03:27	10:21	11:53	13:28
64°	-	02:35	03:43	10:15	11:43	13:12
62°	01:09	02:57	03:56	10:10	11:34	12:59
60°	01:52	03:14	04:07	10:06	11:27	12:48
N 58°	02:19	03:29	04:17	10:02	11:20	12:39
56°	02:40	03:41	04:25	09:58	11:14	12:31
54°	02:56	03:51	04:33	09:55	11:09	12:23
52°	03:10	04:01	04:39	09:52	11:04	12:17
50°	03:22	04:09	04:45	09:50	11:00	12:11
45°	03:46	04:26	04:58	09:44	10:51	11:58
N 40°	04:04	04:39	05:09	09:40	10:43	11:48
35°	04:18	04:51	05:18	09:36	10:37	11:39
30°	04:30	05:00	05:26	09:32	10:31	11:31
20°	04:49	05:16	05:39	09:26	10:21	11:18
N 10°	05:03	05:29	05:51	09:21	10:12	11:06
0°	05:15	05:40	06:02	09:16	10:04	10:55
S 10°	05:26	05:51	06:12	09:11	09:56	10:44
20°	05:35	06:01	06:24	09:06	09:48	10:33
30°	05:43	06:12	06:36	09:00	09:39	10:20
35°	05:48	06:17	06:44	08:57	09:33	10:12
40°	05:52	06:24	06:52	08:53	09:27	10:04
45°	05:56	06:31	07:02	08:49	09:20	09:54
S 50°	06:01	06:39	07:13	08:44	09:11	09:42
52°	06:03	06:43	07:19	08:42	09:07	09:37
54°	06:05	06:47	07:25	08:39	09:03	09:31
56°	06:07	06:51	07:31	08:36	08:58	09:24
58°	06:10	06:56	07:39	08:33	08:53	09:16
S 60°	06:12	07:02	07:47	08:30	08:47	09:08
S 62°	06:15	07:08	07:57	08:26	08:40	08:58

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 11	Moonset 12	Moonset 13
N 72°	22:01	-	-	19:45	19:32	19:13
N 70°	21:25	-	-	19:58	19:54	19:50
68°	21:00	22:43	-	20:08	20:11	20:16
66°	20:40	22:00	-	20:17	20:25	20:36
64°	20:25	21:32	-	20:24	20:36	20:53
62°	20:12	21:11	22:53	20:30	20:46	21:06
60°	20:01	20:54	22:14	20:36	20:54	21:18
N 58°	19:52	20:39	21:48	20:41	21:02	21:28
56°	19:43	20:28	21:28	20:45	21:08	21:37
54°	19:36	20:17	21:12	20:49	21:14	21:45
52°	19:30	20:08	20:58	20:52	21:19	21:52
50°	19:24	20:00	20:46	20:56	21:24	21:58
45°	19:11	19:43	20:23	21:03	21:35	22:12
N 40°	19:01	19:30	20:05	21:08	21:43	22:23
35°	18:52	19:19	19:51	21:13	21:51	22:32
30°	18:44	19:09	19:39	21:18	21:57	22:41
20°	18:31	18:54	19:21	21:26	22:09	22:56
N 10°	18:19	18:41	19:06	21:33	22:19	23:08
0°	18:08	18:30	18:55	21:39	22:28	23:21
S 10°	17:58	18:19	18:45	21:45	22:38	23:33
20°	17:47	18:09	18:36	21:52	22:48	23:46
30°	17:34	17:59	18:27	22:00	22:59	24:00
35°	17:27	17:53	18:23	22:05	23:06	24:09
40°	17:18	17:47	18:19	22:10	23:14	24:19
45°	17:09	17:40	18:14	22:16	23:23	24:30
S 50°	16:57	17:31	18:10	22:23	23:33	24:44
52°	16:52	17:28	18:08	22:26	23:38	24:51
54°	16:46	17:24	18:06	22:30	23:44	24:58
56°	16:40	17:19	18:04	22:34	23:50	25:06
58°	16:32	17:15	18:01	22:39	23:57	25:15
S 60°	16:24	17:09	17:59	22:44	-	00:05
S 62°	16:14	17:03	17:56	22:50	-	00:14

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
11	5 15	5 10	12:05	15:28	03:04	5d 20%
12	5 05	5 00	12:05	16:16	03:52	6d 29%
13	4 55	4 49	12:05	17:08	04:42	7d 40%

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2013 August 14, 15, 16 (Wed, Thur, Fri)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
14 Wednesday 00	322° 34'.9	145° 07'.6	2° 02'.0 N	209° 51'.0	22° 37'.8 N	221° 00'.9	22° 51'.8 N	108° 12'.4	11° 18'.1 S
01	337° 37'.3	160° 07'.3	00'.7	224° 51'.8	37'.6	236° 02'.8	51'.7	123° 14'.7	18'.1
02	352° 39'.8	175° 07'.1	1° 59'.4 N	239° 52'.5	37'.3	251° 04'.8	51'.7	138° 17'.0	18'.2
03	7° 42'.3	190° 06'.9	58'.1	254° 53'.2	37'.1	266° 06'.7	51'.7	153° 19'.4	18'.2
04	22° 44'.7	205° 06'.7	56'.8	269° 53'.9	36'.9	281° 08'.6	51'.6	168° 21'.7	18'.3
05	37° 47'.2	220° 06'.5	55'.6	284° 54'.6	36'.7	296° 10'.5	51'.6	183° 24'.0	18'.4
06	52° 49'.6	235° 06'.3	54'.3	299° 55'.3	36'.4	311° 12'.5	51'.5	198° 26'.4	18'.4
07	67° 52'.1	250° 06'.0	53'.0	314° 56'.1	36'.2	326° 14'.4	51'.5	213° 28'.7	18'.5
08	82° 54'.6	265° 05'.8	51'.7	329° 56'.8	36'.0	341° 16'.3	51'.5	228° 31'.0	18'.5
09	97° 57'.0	280° 05'.6	50'.4	344° 57'.5	35'.7	356° 18'.3	51'.4	243° 33'.3	18'.6
10	112° 59'.5	295° 05'.4	49'.1	359° 58'.2	35'.5	11° 20'.2	51'.4	258° 35'.7	18'.6
11	128° 02'.0	310° 05'.2	47'.9	14° 58'.9	35'.3	26° 22'.1	51'.4	273° 38'.0	18'.7
12	143° 04'.4	325° 05'.0	1° 46'.6 N	29° 59'.6	22° 35'.1 N	41° 24'.1	22° 51'.3 N	288° 40'.3	11° 18'.8 S
13	158° 06'.9	340° 04'.8	45'.3	45° 00'.4	34'.8	56° 26'.0	51'.3	303° 42'.6	18'.8
14	173° 09'.4	355° 04'.6	44'.0	60° 01'.1	34'.6	71° 27'.9	51'.3	318° 45'.0	18'.9
15	188° 11'.8	10° 04'.3	42'.7	75° 01'.8	34'.4	86° 29'.8	51'.2	333° 47'.3	18'.9
16	203° 14'.3	25° 04'.1	41'.4	90° 02'.5	34'.1	101° 31'.8	51'.2	348° 49'.6	19'.0
17	218° 16'.8	40° 03'.9	40'.2	105° 03'.2	33'.9	116° 33'.7	51'.1	3° 52'.0	19'.0
18	233° 19'.2	55° 03'.7	38'.9	120° 04'.0	33'.7	131° 35'.6	51'.1	18° 54'.3	19'.1
19	248° 21'.7	70° 03'.5	37'.6	135° 04'.7	33'.4	146° 37'.6	51'.1	33° 56'.6	19'.2
20	263° 24'.1	85° 03'.3	36'.3	150° 05'.4	33'.2	161° 39'.5	51'.0	48° 58'.9	19'.2
21	278° 26'.6	100° 03'.1	35'.0	165° 06'.1	33'.0	176° 41'.4	51'.0	64° 01'.3	19'.3
22	293° 29'.1	115° 02'.9	33'.7	180° 06'.8	32'.7	191° 43'.4	51'.0	79° 03'.6	19'.3
23	308° 31'.5	130° 02'.6	32'.4	195° 07'.6	32'.5	206° 45'.3	50'.9	94° 05'.9	19'.4
15 Thursday 00	323° 34'.0	145° 02'.4	1° 31'.2 N	210° 08'.3	22° 32'.3 N	221° 47'.2	22° 50'.9 N	109° 08'.2	11° 19'.4 S
01	338° 36'.5	160° 02'.2	29'.9	225° 09'.0	32'.0	236° 49'.2	50'.9	124° 10'.6	19'.5
02	353° 38'.9	175° 02'.0	28'.6	240° 09'.7	31'.8	251° 51'.1	50'.8	139° 12'.9	19'.6
03	8° 41'.4	190° 01'.8	27'.3	255° 10'.4	31'.6	266° 53'.0	50'.8	154° 15'.2	19'.6
04	23° 43'.9	205° 01'.6	26'.0	270° 11'.2	31'.3	281° 55'.0	50'.7	169° 17'.5	19'.7
05	38° 46'.3	220° 01'.4	24'.7	285° 11'.9	31'.1	296° 56'.9	50'.7	184° 19'.9	19'.7
06	53° 48'.8	235° 01'.2	23'.5	300° 12'.6	30'.9	311° 58'.8	50'.7	199° 22'.2	19'.8
07	68° 51'.2	250° 00'.9	22'.2	315° 13'.3	30'.6	327° 00'.7	50'.6	214° 24'.5	19'.8
08	83° 53'.7	265° 00'.7	20'.9	330° 14'.0	30'.4	342° 02'.7	50'.6	229° 26'.8	19'.9
09	98° 56'.2	280° 00'.5	19'.6	345° 14'.8	30'.2	357° 04'.6	50'.6	244° 29'.2	20'.0
10	113° 58'.6	295° 00'.3	18'.3	0° 15'.5	29'.9	12° 06'.5	50'.5	259° 31'.5	20'.0
11	129° 01'.1	310° 00'.1	17'.0	15° 16'.2	29'.7	27° 08'.5	50'.5	274° 33'.8	20'.1
12	144° 03'.6	324° 59'.9	1° 15'.7 N	30° 16'.9	22° 29'.4 N	42° 10'.4	22° 50'.5 N	289° 36'.1	11° 20'.1 S
13	159° 06'.0	339° 59'.7	14'.5	45° 17'.7	29'.2	57° 12'.3	50'.4	304° 38'.5	20'.2
14	174° 08'.5	354° 59'.5	13'.2	60° 18'.4	29'.0	72° 14'.3	50'.4	319° 40'.8	20'.3
15	189° 11'.0	9° 59'.3	11'.9	75° 19'.1	28'.7	87° 16'.2	50'.3	334° 43'.1	20'.3
16	204° 13'.4	24° 59'.1	10'.6	90° 19'.8	28'.5	102° 18'.1	50'.3	349° 45'.4	20'.4
17	219° 15'.9	39° 58'.9	09'.3	105° 20'.5	28'.3	117° 20'.1	50'.3	4° 47'.8	20'.4
18	234° 18'.4	54° 58'.6	08'.0	120° 21'.3	28'.0	132° 22'.0	50'.2	19° 50'.1	20'.5
19	249° 20'.8	69° 58'.4	06'.7	135° 22'.0	27'.8	147° 24'.0	50'.2	34° 52'.4	20'.5
20	264° 23'.3	84° 58'.2	05'.5	150° 22'.7	27'.5	162° 25'.9	50'.2	49° 54'.7	20'.6
21	279° 25'.7	99° 58'.0	04'.2	165° 23'.4	27'.3	177° 27'.8	50'.1	64° 57'.1	20'.7
22	294° 28'.2	114° 57'.8	02'.9	180° 24'.2	27'.1	192° 29'.8	50'.1	79° 59'.4	20'.7
23	309° 30'.7	129° 57'.6	01'.6	195° 24'.9	26'.8	207° 31'.7	50'.1	95° 01'.7	20'.8
16 Friday 00	324° 33'.1	144° 57'.4	1° 00'.3 N	210° 25'.6	22° 26'.6 N	222° 33'.6	22° 50'.0 N	110° 04'.0	11° 20'.8 S
01	339° 35'.6	159° 57'.2	0° 59'.0 N	225° 26'.3	26'.3	237° 35'.6	50'.0	125° 06'.3	20'.9
02	354° 38'.1	174° 57'.0	57'.7	240° 27'.1	26'.1	252° 37'.5	49'.9	140° 08'.7	21'.0
03	9° 40'.5	189° 56'.8	56'.5	255° 27'.8	25'.8	267° 39'.4	49'.9	155° 11'.0	21'.0
04	24° 43'.0	204° 56'.6	55'.2	270° 28'.5	25'.6	282° 41'.4	49'.9	170° 13'.3	21'.1
05	39° 45'.5	219° 56'.4	53'.9	285° 29'.2	25'.4	297° 43'.3	49'.8	185° 15'.6	21'.1
06	54° 47'.9	234° 56'.1	52'.6	300° 30'.0	25'.1	312° 45'.2	49'.8	200° 18'.0	21'.2
07	69° 50'.4	249° 55'.9	51'.3	315° 30'.7	24'.9	327° 47'.2	49'.8	215° 20'.3	21'.3
08	84° 52'.9	264° 55'.7	50'.0	330° 31'.4	24'.6	342° 49'.1	49'.7	230° 22'.6	21'.3
09	99° 55'.3	279° 55'.5	48'.7	345° 32'.1	24'.4	357° 51'.0	49'.7	245° 24'.9	21'.4
10	114° 57'.8	294° 55'.3	47'.4	0° 32'.9	24'.2	12° 53'.0	49'.6	260° 27'.2	21'.4
11	130° 00'.2	309° 55'.1	46'.2	15° 33'.6	23'.9	27° 54'.9	49'.6	275° 29'.6	21'.5
12	145° 02'.7	324° 54'.9	0° 44'.9 N	30° 34'.3	22° 23'.7 N	42° 56'.9	22° 49'.6 N	290° 31'.9	11° 21'.5 S
13	160° 05'.2	339° 54'.7	43'.6	45° 35'.1	23'.4	57° 58'.8	49'.5	305° 34'.2	21'.6
14	175° 07'.6	354° 54'.5	42'.3	60° 35'.8	23'.2	73° 00'.7	49'.5	320° 36'.5	21'.7
15	190° 10'.1	9° 54'.3	41'.0	75° 36'.5	22'.9	88° 02'.7	49'.5	335° 38'.8	21'.7
16	205° 12'.6	24° 54'.1	39'.7	90° 37'.2	22'.7	103° 04'.6	49'.4	350° 41'.2	21'.8
17	220° 15'.0	39° 53'.9	38'.4	105° 38'.0	22'.4	118° 06'.5	49'.4	5° 43'.5	21'.8
18	235° 17'.5	54° 53'.7	37'.2	120° 38'.7	22'.2	133° 08'.5	49'.3	20° 45'.8	21'.9
19	250° 20'.0	69° 53'.5	35'.9	135° 39'.4	21'.9	148° 10'.4	49'.3	35° 48'.1	22'.0
20	265° 22'.4	84° 53'.3	34'.6	150° 40'.1	21'.7	163° 12'.4	49'.3	50° 50'.4	22'.0
21	280° 24'.9	99° 53'.1	33'.3	165° 40'.9	21'.5	178° 14'.3	49'.2	65° 52'.8	22'.1
22	295° 27'.4	114° 52'.9	32'.0	180° 41'.6	21'.2	193° 16'.2	49'.2	80° 55'.1	22'.1
23	310° 29'.8	129° 52'.7	30'.7	195° 42'.3	21'.0	208° 18'.2	49'.2	95° 57'.4	22'.2
	M.P. 02:21	v -0'.2	d 1'.3	v 0'.7	d 0'.2	v 1'.9	d 0'.0	v 2'.3	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.2	40° 14'.8 S
Achernar	335° 26'.5	57° 09'.7 S
Acrux	173° 09'.6	63° 10'.7 S
Adhara	255° 12'.7	28° 59'.4 S
Aldebaran	290° 49'.3	16° 32'.1 N
Alioth	166° 21'.0	55° 53'.4 N
Alkaid	152° 59'.0	49° 15'.0 N
Alnair	27° 43'.1	46° 53'.4 S
Alnilam	275° 46'.4	1° 11'.6 S
Alphard	217° 56'.3	8° 43'.1 S
Alphecca	126° 10'.9	26° 40'.5 N
Alpheratz	357° 43'.0	29° 10'.0 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.3	42° 13'.6 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.9 N
Atria	107° 27'.4	69° 03'.2 S
Avior	234° 18'.5	59° 33'.2 S
Bellatrix	278° 32'.0	6° 21'.6 N
Betelgeuse	271° 01'.3	7° 24'.5 N
Canopus	263° 56'.5	52° 42'.1 S
Capella	280° 34'.5	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.0 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.5	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.7 N
Elnath	278° 12'.6	28° 36'.9 N
Eltanin	90° 45'.8	51° 29'.6 N
Enif	33° 46'.6	9° 56'.5 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.1	57° 11'.6 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.8	60° 26'.5 S
Hamal	328° 00'.5	23° 31'.6 N
Kaus Aust.	83° 43'.3	34° 22'.5 S
Kochab	137° 20'.3	74° 06'.3 N
Markab	13° 37'.9	15° 16'.9 N
Menkar	314° 14'.9	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.5 S
Mirfak	308° 40'.1	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 38'.1	89° 19'.0 N
Pollux	243° 27'.9	27° 59'.4 N
Procyon	244° 59'.9	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.1	8° 11'.2 S
Rigil Kent	139° 51'.5	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 39'.9	56° 36'.6 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 33'.9	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.8	43° 29'.3 S
Vega	80° 38'.5	38° 48'.2 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	181° 28'.4	14:20
Mars	246° 34'.3	09:59
Jupiter	258° 13'.2	09:12
Saturn	145° 34'.2	16:41

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
14 00	178° 49'.1	14° 22'.3 N	99° 21'.6	8'.5	16° 08'.0 S	6'.9	58'.3
01	193° 49'.2	21'.6	113° 49'.1	8'.5	14'.9	6'.9	58'.4
02	208° 49'.4	20'.8	128° 16'.6	8'.4	21'.8	6'.8	
03	223° 49'.5	20'.0	142° 44'.0	8'.3	28'.6	6'.7	
04	238° 49'.6	19'.2	157° 11'.3	8'.2	35'.3	6'.6	
05	253° 49'.7	18'.5	171° 38'.5	8'.1	41'.9	6'.5	58'.5
06	268° 49'.8	17'.7	186° 05'.6	8'.1	48'.4	6'.5	
07	283° 49'.9	16'.9	200° 32'.7	8'.0	54'.9	6'.3	
08	298° 50'.1	16'.1	214° 59'.7	7'.9	17° 01'.2 S	6'.2	
09	313° 50'.2	15'.4	229° 26'.6	7'.9	07'.4	6'.1	58'.6
10	328° 50'.3	14'.6	243° 53'.5	7'.8	13'.5	6'.1	
11	343° 50'.4	13'.8	258° 20'.3	7'.7	19'.6	5'.9	
12	358° 50'.5	14° 13'.1 N	272° 47'.0	7'.7	17° 25'.5 S	5'.8	58'.6
13	13° 50'.7	12'.3	287° 13'.7	7'.6	31'.3	5'.7	58'.7
14	28° 50'.8	11'.5	301° 40'.3	7'.5	37'.0	5'.7	
15	43° 50'.9	10'.7	316° 06'.8	7'.4	42'.7	5'.5	
16	58° 51'.0	10'.0	330° 33'.2	7'.4	48'.2	5'.4	58'.8
17	73° 51'.1	09'.2	344° 59'.6	7'.3	53'.6	5'.3	
18	88° 51'.3	08'.4	359° 25'.9	7'.2	58'.9	5'.2	
19	103° 51'.4	07'.6	13° 52'.1	7'.2	18° 04'.1 S	5'.1	
20	118° 51'.5	06'.8	28° 18'.3	7'.1	09'.2	5'.0	58'.9
21	133° 51'.6	06'.1	42° 44'.4	7'.0	14'.2	4'.9	
22	148° 51'.7	05'.3	57° 10'.4	7'.0	19'.1	4'.7	
23	163° 51'.9	04'.5	71° 36'.4	6'.9	23'.8	4'.7	
15 00	178° 52'.0	14° 03'.7 N	86° 02'.3	6'.8	18° 28'.5 S	4'.5	59'.0
01	193° 52'.1	02'.9	100° 28'.1	6'.8	33'.0	4'.4	
02	208° 52'.2	02'.2	114° 53'.9	6'.7	37'.4	4'.3	
03	223° 52'.4	01'.4	129° 19'.6	6'.6	41'.7	4'.2	
04	238° 52'.5	00'.6	143° 45'.2	6'.6	45'.9	4'.1	59'.1
05	253° 52'.6	13° 59'.8 N	158° 10'.8	6'.5	50'.0	4'.0	
06	268° 52'.7	59'.0	172° 36'.3	6'.4	54'.0	3'.8	
07	283° 52'.8	58'.3	187° 01'.7	6'.4	57'.8	3'.7	
08	298° 53'.0	57'.5	201° 27'.1	6'.4	19° 01'.5 S	3'.6	59'.2
09	313° 53'.1	56'.7	215° 52'.5	6'.2	05'.1	3'.5	
10	328° 53'.2	55'.9	230° 17'.7	6'.2	08'.6	3'.4	
11	343° 53'.3	55'.1	244° 42'.9	6'.2	12'.0	3'.2	
12	358° 53'.5	13° 54'.3 N	259° 08'.1	6'.1	19° 15'.2 S	3'.1	59'.3
13	13° 53'.6	53'.6	273° 33'.2	6'.0	18'.3	3'.0	
14	28° 53'.7	52'.8	287° 58'.2	6'.0	21'.3	2'.9	
15	43° 53'.8	52'.0	302° 23'.2	6'.0	24'.2	2'.7	
16	58° 54'.0	51'.2	316° 48'.2	5'.8	26'.9	2'.6	59'.4
17	73° 54'.1	50'.4	331° 13'.0	5'.9	29'.5	2'.5	
18	88° 54'.2	49'.6	345° 37'.9	5'.8	32'.0	2'.3	
19	103° 54'.4	48'.8	0° 02'.7	5'.7	34'.3	2'.3	
20	118° 54'.5	48'.1	14° 27'.4	5'.7	36'.6	2'.1	59'.5
21	133° 54'.6	47'.3	28° 52'.1	5'.6	38'.7	1'.9	
22	148° 54'.7	46'.5	43° 16'.7	5'.6	40'.6	1'.9	
23	163° 54'.9	45'.7	57° 41'.3	5'.5	42'.5	1'.7	
16 00	178° 55'.0	13° 44'.9 N	72° 05'.8	5'.5	19° 44'.2 S	1'.6	59'.6
01	193° 55'.1	44'.1	86° 30'.3	5'.5	45'.8	1'.4	
02	208° 55'.2	43'.3	100° 54'.8	5'.4	47'.2	1'.3	
03	223° 55'.4	42'.5	115° 19'.2	5'.4	48'.5	1'.2	
04	238° 55'.5	41'.8	129° 43'.6	5'.3	49'.7	1'.0	
05	253° 55'.6	41'.0	144° 07'.9	5'.3	50'.7	0'.9	59'.7
06	268° 55'.8	40'.2	158° 32'.2	5'.3	51'.6	0'.8	
07	283° 55'.9	39'.4	172° 56'.5	5'.2	52'.4	0'.7	
08	298° 56'.0	38'.6	187° 20'.7	5'.2	53'.1	0'.5	
09	313° 56'.2	37'.8	201° 44'.9	5'.1	53'.6	0'.3	59'.8
10	328° 56'.3	37'.0	216° 09'.0	5'.1	53'.9	0'.3	
11	343° 56'.4	36'.2	230° 33'.1	5'.1	54'.2	0'.1	
12	358° 56'.5	13° 35'.4 N	244° 57'.2	5'.1	19° 54'.3 S	0'.1	59'.8
13	13° 56'.7	34'.6	259° 21'.3	5'.0	54'.2	0'.2	
14	28° 56'.8	33'.8	273° 45'.3	5'.0	54'.0	0'.3	59'.9
15	43° 56'.9	33'.0	288° 09'.3	5'.0	53'.7	0'.4	
16	58° 57'.1	32'.2	302° 33'.3	5'.0	53'.3	0'.6	
17	73° 57'.2	31'.4	316° 57'.3	4'.9	52'.7	0'.8	
18	88° 57'.3	30'.7	331° 21'.2	4'.9	51'.9	0'.8	
19	103° 57'.5	29'.9	345° 45'.1	4'.9	51'.1	1'.0	60'.0
20	118° 57'.6	29'.1	0° 09'.0	4'.9	50'.1	1'.2	
21	133° 57'.7	28'.3	14° 32'.9	4'.9	48'.9	1'.3	
22	148° 57'.9	27'.5	28° 56'.8	4'.8	47'.6	1'.4	
23	163° 58'.0	26'.7	43° 20'.6	4'.9	46'.2	1'.6	
	SD 15'.8	d 0'.8	SD 16'.0		16'.1	16'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 14	Moonrise 15	Moonrise 16
N 72°	-	-	02:25	-	-	-
N 70°	-	-	02:57	16:10	18:17	19:55
68°	-	01:44	03:20	15:29	17:04	18:13
66°	-	02:22	03:38	15:01	16:27	17:33
64°	-	02:47	03:52	14:40	16:01	17:06
62°	01:33	03:07	04:04	14:23	15:40	16:45
60°	02:07	03:23	04:14	14:09	15:24	16:28
N 58°	02:30	03:36	04:23	13:57	15:10	16:13
56°	02:49	03:48	04:31	13:46	14:58	16:01
54°	03:04	03:57	04:38	13:37	14:47	15:50
52°	03:17	04:06	04:44	13:29	14:38	15:41
50°	03:28	04:14	04:50	13:22	14:30	15:32
45°	03:50	04:30	05:02	13:06	14:12	15:14
N 40°	04:07	04:43	05:12	12:53	13:57	14:59
35°	04:21	04:53	05:20	12:42	13:45	14:46
30°	04:32	05:02	05:27	12:33	13:35	14:35
20°	04:50	05:17	05:40	12:16	13:16	14:17
N 10°	05:04	05:29	05:51	12:02	13:01	14:00
0°	05:15	05:40	06:01	11:49	12:46	13:45
S 10°	05:24	05:49	06:11	11:36	12:31	13:30
20°	05:33	05:59	06:22	11:22	12:16	13:14
30°	05:41	06:09	06:34	11:06	11:58	12:55
35°	05:44	06:14	06:40	10:57	11:47	12:44
40°	05:48	06:20	06:48	10:46	11:35	12:32
45°	05:52	06:27	06:57	10:34	11:21	12:17
S 50°	05:56	06:34	07:08	10:19	11:04	11:59
52°	05:58	06:38	07:13	10:12	10:56	11:51
54°	06:00	06:41	07:18	10:05	10:47	11:41
56°	06:01	06:45	07:24	09:56	10:37	11:31
58°	06:03	06:49	07:31	09:46	10:26	11:18
S 60°	06:05	06:54	07:39	09:35	10:13	11:04
S 62°	06:07	07:00	07:48	09:23	09:58	10:48

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 14	Moonset 15	Moonset 16
N 72°	21:38	-	-	-	-	-
N 70°	21:08	23:28	-	19:46	19:39	20:06
68°	20:46	22:18	-	20:27	20:52	21:48
66°	20:29	21:43	-	20:56	21:29	22:27
64°	20:14	21:18	23:32	21:17	21:56	22:54
62°	20:03	20:59	22:30	21:35	22:16	23:15
60°	19:53	20:44	21:58	21:50	22:33	23:32
N 58°	19:44	20:31	21:36	22:02	22:47	23:47
56°	19:36	20:20	21:18	22:13	23:00	23:59
54°	19:30	20:10	21:03	22:22	23:10	24:10
52°	19:24	20:02	20:50	22:31	23:20	24:19
50°	19:18	19:54	20:39	22:38	23:28	24:28
45°	19:06	19:38	20:17	22:55	23:46	24:46
N 40°	18:57	19:26	20:01	23:08	-	00:01
35°	18:48	19:15	19:47	23:20	-	00:13
30°	18:41	19:06	19:36	23:30	-	00:24
20°	18:29	18:51	19:18	23:47	-	00:43
N 10°	18:18	18:40	19:05	-	00:02	00:59
0°	18:08	18:29	18:54	-	00:16	01:14
S 10°	17:58	18:20	18:44	-	00:30	01:29
20°	17:47	18:10	18:36	-	00:45	01:45
30°	17:36	18:00	18:29	00:00	01:02	02:04
35°	17:29	17:55	18:25	00:09	01:12	02:14
40°	17:21	17:49	18:21	00:19	01:24	02:27
45°	17:12	17:43	18:17	00:30	01:37	02:41
S 50°	17:02	17:35	18:14	00:44	01:54	02:59
52°	16:57	17:32	18:12	00:51	02:02	03:08
54°	16:51	17:29	18:10	00:58	02:10	03:17
56°	16:45	17:25	18:09	01:06	02:20	03:28
58°	16:38	17:20	18:07	01:15	02:31	03:40
S 60°	16:31	17:16	18:05	01:26	02:44	03:54
S 62°	16:22	17:10	18:03	01:38	02:59	04:10

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
14	4 44	4 38	12:05	18:02	05:35	8d 51%
15	4 32	4 26	12:04	19:00	06:31	9d 62%
16	4 20	4 14	12:04	19:59	07:29	10d 73%

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2013 August 17, 18, 19 (Sat, Sun, Mon)

GMT		ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.6	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
17 Saturday	00	325° 32'.3	144° 52'.4	0° 29'.4 N	210° 43'.1	22° 20'.7 N	223° 20'.1	22° 49'.1 N	110° 59'.7	11° 22'.3 S
	01	340° 34'.7	159° 52'.2	28'.1	225° 43'.8	20'.5	238° 22'.0	49'.1	126° 02'.0	22'.3
	02	355° 37'.2	174° 52'.0	26'.8	240° 44'.5	20'.2	253° 24'.0	49'.1	141° 04'.4	22'.4
	03	10° 39'.7	189° 51'.8	25'.6	255° 45'.3	20'.0	268° 25'.9	49'.0	156° 06'.7	22'.4
	04	25° 42'.1	204° 51'.6	24'.3	270° 46'.0	19'.7	283° 27'.9	49'.0	171° 09'.0	22'.5
	05	40° 44'.6	219° 51'.4	23'.0	285° 46'.7	19'.5	298° 29'.8	48'.9	186° 11'.3	22'.6
	06	55° 47'.1	234° 51'.2	21'.7	300° 47'.4	19'.2	313° 31'.7	48'.9	201° 13'.6	22'.6
	07	70° 49'.5	249° 51'.0	20'.4	315° 48'.2	19'.0	328° 33'.7	48'.9	216° 16'.0	22'.7
	08	85° 52'.0	264° 50'.8	19'.1	330° 48'.9	18'.7	343° 35'.6	48'.8	231° 18'.3	22'.7
	09	100° 54'.5	279° 50'.6	17'.8	345° 49'.6	18'.5	358° 37'.6	48'.8	246° 20'.6	22'.8
	10	115° 56'.9	294° 50'.4	16'.5	0° 50'.4	18'.2	13° 39'.5	48'.8	261° 22'.9	22'.9
	11	130° 59'.4	309° 50'.2	15'.3	15° 51'.1	18'.0	28° 41'.4	48'.7	276° 25'.2	22'.9
	12	146° 01'.8	324° 50'.0	0° 14'.0 N	30° 51'.8	22° 17'.7 N	43° 43'.4	22° 48'.7 N	291° 27'.5	11° 23'.0 S
	13	161° 04'.3	339° 49'.8	12'.7	45° 52'.6	17'.5	58° 45'.3	48'.6	306° 29'.9	23'.0
	14	176° 06'.8	354° 49'.6	11'.4	60° 53'.3	17'.2	73° 47'.3	48'.6	321° 32'.2	23'.1
	15	191° 09'.2	9° 49'.4	10'.1	75° 54'.0	17'.0	88° 49'.2	48'.6	336° 34'.5	23'.2
	16	206° 11'.7	24° 49'.2	08'.8	90° 54'.8	16'.7	103° 51'.1	48'.5	351° 36'.8	23'.2
	17	221° 14'.2	39° 49'.0	07'.5	105° 55'.5	16'.5	118° 53'.1	48'.5	6° 39'.1	23'.3
	18	236° 16'.6	54° 48'.8	06'.2	120° 56'.2	16'.2	133° 55'.0	48'.5	21° 41'.5	23'.3
	19	251° 19'.1	69° 48'.6	04'.9	135° 57'.0	16'.0	148° 57'.0	48'.4	36° 43'.8	23'.4
	20	266° 21'.6	84° 48'.4	03'.7	150° 57'.7	15'.7	163° 58'.9	48'.4	51° 46'.1	23'.5
	21	281° 24'.0	99° 48'.2	02'.4	165° 58'.4	15'.5	179° 00'.8	48'.3	66° 48'.4	23'.5
	22	296° 26'.5	114° 48'.0	01'.1	180° 59'.2	15'.2	194° 02'.8	48'.3	81° 50'.7	23'.6
	23	311° 29'.0	129° 47'.8	00'.2	195° 59'.9	14'.9	209° 04'.7	48'.3	96° 53'.0	23'.6
18 Sunday	00	326° 31'.4	144° 47'.6	0° 01'.5 S	211° 00'.6	22° 14'.7 N	224° 06'.7	22° 48'.2 N	111° 55'.4	11° 23'.7 S
	01	341° 33'.9	159° 47'.4	02'.8	226° 01'.4	14'.4	239° 08'.6	48'.2	126° 57'.7	23'.8
	02	356° 36'.3	174° 47'.2	04'.1	241° 02'.1	14'.2	254° 10'.6	48'.2	142° 00'.0	23'.8
	03	11° 38'.8	189° 47'.0	05'.4	256° 02'.8	13'.9	269° 12'.5	48'.1	157° 02'.3	23'.9
	04	26° 41'.3	204° 46'.8	06'.7	271° 03'.6	13'.7	284° 14'.4	48'.1	172° 04'.6	24'.0
	05	41° 43'.7	219° 46'.6	07'.9	286° 04'.3	13'.4	299° 16'.4	48'.0	187° 06'.9	24'.0
	06	56° 46'.2	234° 46'.4	09'.2	301° 05'.0	13'.2	314° 18'.3	48'.0	202° 09'.2	24'.1
	07	71° 48'.7	249° 46'.2	10'.5	316° 05'.8	12'.9	329° 20'.3	48'.0	217° 11'.6	24'.1
	08	86° 51'.1	264° 46'.0	11'.8	331° 06'.5	12'.6	344° 22'.2	47'.9	232° 13'.9	24'.2
	09	101° 53'.6	279° 45'.8	13'.1	346° 07'.2	12'.4	359° 24'.2	47'.9	247° 16'.2	24'.3
	10	116° 56'.1	294° 45'.6	14'.4	1° 08'.0	12'.1	14° 26'.1	47'.8	262° 18'.5	24'.3
	11	131° 58'.5	309° 45'.4	15'.7	16° 08'.7	11'.9	29° 28'.0	47'.8	277° 20'.8	24'.4
	12	147° 01'.0	324° 45'.2	0° 17'.0 S	31° 09'.4	22° 11'.6 N	44° 30'.0	22° 47'.8 N	292° 23'.1	11° 24'.4 S
	13	162° 03'.5	339° 45'.0	18'.3	46° 10'.2	11'.4	59° 31'.9	47'.7	307° 25'.4	24'.5
	14	177° 05'.9	354° 44'.8	19'.5	61° 10'.9	11'.1	74° 33'.9	47'.7	322° 27'.8	24'.6
	15	192° 08'.4	9° 44'.6	20'.8	76° 11'.7	10'.8	89° 35'.8	47'.7	337° 30'.1	24'.6
	16	207° 10'.8	24° 44'.4	22'.1	91° 12'.4	10'.6	104° 37'.8	47'.6	352° 32'.4	24'.7
	17	222° 13'.3	39° 44'.2	23'.4	106° 13'.1	10'.3	119° 39'.7	47'.6	7° 34'.7	24'.7
	18	237° 15'.8	54° 44'.0	24'.7	121° 13'.9	10'.1	134° 41'.6	47'.5	22° 37'.0	24'.8
	19	252° 18'.2	69° 43'.8	26'.0	136° 14'.6	09'.8	149° 43'.6	47'.5	37° 39'.3	24'.9
	20	267° 20'.7	84° 43'.6	27'.3	151° 15'.3	09'.5	164° 45'.5	47'.5	52° 41'.6	24'.9
	21	282° 23'.2	99° 43'.4	28'.6	166° 16'.1	09'.3	179° 47'.5	47'.4	67° 44'.0	25'.0
	22	297° 25'.6	114° 43'.2	29'.9	181° 16'.8	09'.0	194° 49'.4	47'.4	82° 46'.3	25'.1
	23	312° 28'.1	129° 43'.0	31'.1	196° 17'.6	08'.8	209° 51'.4	47'.4	97° 48'.6	25'.1
19 Monday	00	327° 30'.6	144° 42'.8	0° 32'.4 S	211° 18'.3	22° 08'.5 N	224° 53'.3	22° 47'.3 N	112° 50'.9	11° 25'.2 S
	01	342° 33'.0	159° 42'.6	33'.7	226° 19'.0	08'.2	239° 55'.3	47'.3	127° 53'.2	25'.2
	02	357° 35'.5	174° 42'.4	35'.0	241° 19'.8	08'.0	254° 57'.2	47'.2	142° 55'.5	25'.3
	03	12° 38'.0	189° 42'.2	36'.3	256° 20'.5	07'.7	269° 59'.2	47'.2	157° 57'.8	25'.4
	04	27° 40'.4	204° 42'.0	37'.6	271° 21'.2	07'.5	285° 01'.1	47'.2	173° 00'.1	25'.4
	05	42° 42'.9	219° 41'.8	38'.9	286° 22'.0	07'.2	300° 03'.0	47'.1	188° 02'.5	25'.5
	06	57° 45'.3	234° 41'.6	40'.2	301° 22'.7	06'.9	315° 05'.0	47'.1	203° 04'.8	25'.5
	07	72° 47'.8	249° 41'.4	41'.5	316° 23'.5	06'.7	330° 06'.9	47'.0	218° 07'.1	25'.6
	08	87° 50'.3	264° 41'.2	42'.8	331° 24'.2	06'.4	345° 08'.9	47'.0	233° 09'.4	25'.7
	09	102° 52'.7	279° 41'.0	44'.0	346° 24'.9	06'.1	0° 10'.8	47'.0	248° 11'.7	25'.7
	10	117° 55'.2	294° 40'.8	45'.3	1° 25'.7	05'.9	15° 12'.8	46'.9	263° 14'.0	25'.8
	11	132° 57'.7	309° 40'.6	46'.6	16° 26'.4	05'.6	30° 14'.7	46'.9	278° 16'.3	25'.9
	12	148° 00'.1	324° 40'.4	0° 47'.9 S	31° 27'.2	22° 05'.4 N	45° 16'.7	22° 46'.9 N	293° 18'.6	11° 25'.9 S
	13	163° 02'.6	339° 40'.2	49'.2	46° 27'.9	05'.1	60° 18'.6	46'.8	308° 20'.9	26'.0
	14	178° 05'.1	354° 40'.0	50'.5	61° 28'.7	04'.8	75° 20'.6	46'.8	323° 23'.3	26'.0
	15	193° 07'.5	9° 39'.8	51'.8	76° 29'.4	04'.6	90° 22'.5	46'.7	338° 25'.6	26'.1
	16	208° 10'.0	24° 39'.6	53'.1	91° 30'.1	04'.3	105° 24'.5	46'.7	353° 27'.9	26'.2
	17	223° 12'.4	39° 39'.4	54'.4	106° 30'.9	04'.0	120° 26'.4	46'.7	8° 30'.2	26'.2
	18	238° 14'.9	54° 39'.2	55'.6	121° 31'.6	03'.8	135° 28'.4	46'.6	23° 32'.5	26'.3
	19	253° 17'.4	69° 39'.0	56'.9	136° 32'.4	03'.5	150° 30'.3	46'.6	38° 34'.8	26'.4
	20	268° 19'.8	84° 38'.8	58'.2	151° 33'.1	03'.2	165° 32'.3	46'.6	53° 37'.1	26'.4
	21	283° 22'.3	99° 38'.6	59'.5	166° 33'.8	03'.0	180° 34'.2	46'.5	68° 39'.4	26'.5
	22	298° 24'.8	114° 38'.4	1° 00'.8 S	181° 34'.6	02'.7	195° 36'.2	46'.5	83° 41'.7	26'.5
	23	313° 27'.2	129° 38'.2	02'.1	196° 35'.3	02'.4	210° 38'.1	46'.4	98° 44'.1	26'.6
		M.P. 02:10	v -0'.2	d 1'.3	v 0'.7	d 0'.3	v 1'.9	d 0'.0	v 2'.3	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.2	40° 14'.8 S
Achernar	335° 26'.4	57° 09'.7 S
Acrux	173° 09'.6	63° 10'.7 S
Adhara	255° 12'.7	28° 59'.4 S
Aldebaran	290° 49'.3	16° 32'.1 N
Alioth	166° 21'.0	55° 53'.4 N
Alkaid	152° 59'.0	49° 15'.0 N
Alnair	27° 43'.1	46° 53'.4 S
Alnilam	275° 46'.4	1° 11'.6 S
Alphard	217° 56'.3	8° 43'.1 S
Alphecca	126° 10'.9	26° 40'.5 N
Alpheratz	357° 43'.0	29° 10'.0 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.3	42° 13'.6 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.9 N
Atria	107° 27'.4	69° 03'.2 S
Avior	234° 18'.5	59° 33'.2 S
Bellatrix	278° 32'.0	6° 21'.6 N
Betelgeuse	271° 01'.3	7° 24'.5 N
Canopus	263° 56'.4	52° 42'.1 S
Capella	280° 34'.4	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.0 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.5	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.7 N
Elnath	278° 12'.6	28° 36'.9 N
Eltanin	90° 45'.8	51° 29'.6 N
Enif	33° 46'.6	9° 56'.5 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.1	57° 11'.6 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.9	60° 26'.5 S
Hamal	328° 00'.4	23° 31'.6 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 20'.3	74° 06'.3 N
Markab	13° 37'.9	15° 16'.9 N
Menkar	314° 14'.8	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.5 S
Mirfak	308° 40'.1	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 36'.5	89° 19'.0 N
Pollux	243° 27'.9	27° 59'.4 N
Procyon	244° 59'.9	5° 11'.3 N
Rasalhague	96° 06'.1	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.2 S
Rigil Kent	139° 51'.6	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 39'.9	56° 36'.6 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 33'.8	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.3 S
Vega	80° 38'.6	38° 48'.2 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	178° 16'.2	14:21
Mars	244° 29'.2	09:55
Jupiter	257° 35'.2	09:02
Saturn	145° 23'.9	16:30

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
17 00	178° 58'.1	13° 25'.9 N	57° 44'.5	4'.8	19° 44'.6 S	1'.7	60'.1
01	193° 58'.3	25'.1	72° 08'.3	4'.8	42'.9	1'.8	
02	208° 58'.4	24'.3	86° 32'.1	4'.8	41'.1	2'.0	
03	223° 58'.5	23'.5	100° 55'.9	4'.8	39'.1	2'.1	
04	238° 58'.7	22'.7	115° 19'.7	4'.8	37'.0	2'.3	
05	253° 58'.8	21'.9	129° 43'.5	4'.8	34'.7	2'.4	
06	268° 58'.9	21'.1	144° 07'.3	4'.7	32'.3	2'.5	60'.2
07	283° 59'.1	20'.3	158° 31'.0	4'.8	29'.8	2'.7	
08	298° 59'.2	19'.5	172° 54'.8	4'.8	27'.1	2'.8	
09	313° 59'.3	18'.7	187° 18'.6	4'.8	24'.3	2'.9	
10	328° 59'.5	17'.9	201° 42'.4	4'.7	21'.4	3'.1	
11	343° 59'.6	17'.1	216° 06'.1	4'.8	18'.3	3'.2	
12	358° 59'.8	13° 16'.3 N	230° 29'.9	4'.8	19° 15'.1 S	3'.4	60'.2
13	13° 59'.9	15'.5	244° 53'.7	4'.8	11'.7	3'.5	60'.3
14	29° 00'.0	14'.7	259° 17'.5	4'.8	08'.2	3'.6	
15	44° 00'.2	13'.9	273° 41'.3	4'.8	04'.6	3'.8	
16	59° 00'.3	13'.1	288° 05'.1	4'.8	00'.8	3'.9	
17	74° 00'.4	12'.3	302° 28'.9	4'.8	18° 56'.9 S	4'.0	
18	89° 00'.6	11'.5	316° 52'.7	4'.9	52'.9	4'.2	
19	104° 00'.7	10'.7	331° 16'.6	4'.8	48'.7	4'.3	
20	119° 00'.9	09'.8	345° 40'.4	4'.9	44'.4	4'.5	60'.4
21	134° 01'.0	09'.0	0° 04'.3	4'.9	39'.9	4'.5	
22	149° 01'.1	08'.2	14° 28'.2	4'.9	35'.4	4'.7	
23	164° 01'.3	07'.4	28° 52'.1	4'.9	30'.7	4'.9	
18 00	179° 01'.4	13° 06'.6 N	43° 16'.0	5'.0	18° 25'.8 S	5'.0	60'.4
01	194° 01'.5	05'.8	57° 40'.0	5'.0	20'.8	5'.1	
02	209° 01'.7	05'.0	72° 04'.0	4'.9	15'.7	5'.2	
03	224° 01'.8	04'.2	86° 27'.9	5'.1	10'.5	5'.3	
04	239° 02'.0	03'.4	100° 52'.0	5'.0	05'.2	5'.5	
05	254° 02'.1	02'.6	115° 16'.0	5'.1	17° 59'.7 S	5'.7	
06	269° 02'.2	01'.8	129° 40'.1	5'.1	54'.0	5'.7	60'.5
07	284° 02'.4	01'.0	144° 04'.2	5'.1	48'.3	5'.9	
08	299° 02'.5	00'.2	158° 28'.3	5'.2	42'.4	6'.0	
09	314° 02'.7	12° 59'.4 N	172° 52'.5	5'.2	36'.4	6'.1	
10	329° 02'.8	58'.5	187° 16'.7	5'.2	30'.3	6'.2	
11	344° 03'.0	57'.7	201° 40'.9	5'.2	24'.1	6'.4	
12	359° 03'.1	12° 56'.9 N	216° 05'.1	5'.3	17° 17'.7 S	6'.5	60'.5
13	14° 03'.2	56'.1	230° 29'.4	5'.4	11'.2	6'.6	
14	29° 03'.4	55'.3	244° 53'.8	5'.3	04'.6	6'.7	
15	44° 03'.5	54'.5	259° 18'.1	5'.4	16° 57'.9 S	6'.9	
16	59° 03'.7	53'.7	273° 42'.5	5'.5	51'.0	6'.9	
17	74° 03'.8	52'.9	288° 07'.0	5'.4	44'.1	7'.1	
18	89° 03'.9	52'.1	302° 31'.4	5'.6	37'.0	7'.2	
19	104° 04'.1	51'.2	316° 56'.0	5'.5	29'.8	7'.3	
20	119° 04'.2	50'.4	331° 20'.5	5'.6	22'.5	7'.4	
21	134° 04'.4	49'.6	345° 45'.1	5'.7	15'.1	7'.6	
22	149° 04'.5	48'.8	0° 09'.8	5'.7	07'.5	7'.6	
23	164° 04'.7	48'.0	14° 34'.5	5'.7	15° 59'.9 S	7'.8	
19 00	179° 04'.8	12° 47'.2 N	28° 59'.2	5'.8	15° 52'.1 S	7'.8	60'.5
01	194° 05'.0	46'.4	43° 24'.0	5'.8	44'.3	8'.0	
02	209° 05'.1	45'.5	57° 48'.8	5'.9	36'.3	8'.1	
03	224° 05'.2	44'.7	72° 13'.7	5'.9	28'.2	8'.2	
04	239° 05'.4	43'.9	86° 38'.6	6'.0	20'.0	8'.3	
05	254° 05'.5	43'.1	101° 03'.6	6'.0	11'.7	8'.4	
06	269° 05'.7	42'.3	115° 28'.6	6'.1	03'.3	8'.5	
07	284° 05'.8	41'.5	129° 53'.7	6'.1	14° 54'.8 S	8'.6	
08	299° 06'.0	40'.6	144° 18'.8	6'.2	46'.2	8'.7	
09	314° 06'.1	39'.8	158° 44'.0	6'.2	37'.5	8'.7	
10	329° 06'.3	39'.0	173° 09'.2	6'.3	28'.8	8'.9	
11	344° 06'.4	38'.2	187° 34'.5	6'.3	19'.9	9'.0	
12	359° 06'.6	12° 37'.4 N	201° 59'.8	6'.4	14° 10'.9 S	9'.1	60'.5
13	14° 06'.7	36'.6	216° 25'.2	6'.5	01'.8	9'.2	
14	29° 06'.9	35'.7	230° 50'.7	6'.4	13° 52'.6 S	9'.2	
15	44° 07'.0	34'.9	245° 16'.1	6'.6	43'.4	9'.4	
16	59° 07'.1	34'.1	259° 41'.7	6'.6	34'.0	9'.4	
17	74° 07'.3	33'.3	274° 07'.3	6'.7	24'.6	9'.5	
18	89° 07'.4	32'.5	288° 33'.0	6'.7	15'.1	9'.7	
19	104° 07'.6	31'.6	302° 58'.7	6'.7	05'.4	9'.7	
20	119° 07'.7	30'.8	317° 24'.4	6'.9	12° 55'.7 S	9'.7	
21	134° 07'.9	30'.0	331° 50'.3	6'.8	46'.0	9'.9	60'.4
22	149° 08'.0	29'.2	346° 16'.1	7'.0	36'.1	9'.9	
23	164° 08'.2	28'.3	0° 42'.1	7'.0	26'.2	10'.1	
	SD 15'.8	d 0'.8	SD 16'.4		16'.5	16'.5	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 17	Moonrise 18	Moonrise 19
N 72°	-	-	02:45	-	20:18	19:53
N 70°	-	01:15	03:12	19:38	19:34	19:29
68°	-	02:06	03:32	18:48	19:04	19:11
66°	-	02:37	03:48	18:16	18:41	18:56
64°	01:06	02:59	04:01	17:53	18:23	18:44
62°	01:51	03:17	04:12	17:34	18:08	18:33
60°	02:20	03:32	04:22	17:18	17:56	18:24
N 58°	02:41	03:44	04:30	17:05	17:45	18:16
56°	02:58	03:54	04:37	16:54	17:36	18:09
54°	03:12	04:03	04:43	16:44	17:27	18:03
52°	03:24	04:11	04:49	16:35	17:20	17:57
50°	03:34	04:19	04:54	16:27	17:13	17:52
45°	03:55	04:34	05:05	16:10	16:59	17:41
N 40°	04:11	04:46	05:14	15:56	16:46	17:31
35°	04:24	04:56	05:22	15:44	16:36	17:24
30°	04:34	05:04	05:29	15:33	16:27	17:16
20°	04:51	05:18	05:41	15:16	16:12	17:04
N 10°	05:04	05:29	05:51	15:00	15:58	16:54
0°	05:15	05:39	06:00	14:45	15:45	16:44
S 10°	05:23	05:48	06:10	14:31	15:33	16:34
20°	05:31	05:57	06:20	14:15	15:19	16:23
30°	05:38	06:06	06:31	13:57	15:03	16:10
35°	05:41	06:11	06:37	13:47	14:54	16:03
40°	05:45	06:16	06:44	13:35	14:44	15:55
45°	05:48	06:22	06:52	13:21	14:31	15:46
S 50°	05:51	06:29	07:02	13:04	14:17	15:34
52°	05:52	06:32	07:07	12:56	14:10	15:29
54°	05:54	06:35	07:12	12:47	14:02	15:23
56°	05:55	06:39	07:18	12:36	13:53	15:16
58°	05:56	06:42	07:24	12:25	13:43	15:09
S 60°	05:58	06:47	07:31	12:11	13:32	15:00
S 62°	05:59	06:51	07:39	11:56	13:19	14:51

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 17	Moonset 18	Moonset 19
N 72°	21:18	-	-	-	23:55	-
N 70°	20:52	22:42	-	22:29	-	00:38
68°	20:32	21:56	-	23:19	-	01:07
66°	20:17	21:27	-	23:50	-	01:29
64°	20:04	21:05	22:53	-	00:13	01:46
62°	19:53	20:48	22:11	-	00:32	02:00
60°	19:44	20:34	21:44	-	00:47	02:12
N 58°	19:36	20:22	21:24	-	01:00	02:22
56°	19:29	20:12	21:08	-	01:11	02:31
54°	19:23	20:03	20:54	00:10	01:20	02:39
52°	19:17	19:55	20:42	00:19	01:29	02:46
50°	19:12	19:48	20:32	00:28	01:37	02:53
45°	19:01	19:33	20:12	00:46	01:53	03:06
N 40°	18:52	19:21	19:56	01:01	02:07	03:17
35°	18:45	19:11	19:43	01:13	02:18	03:27
30°	18:38	19:03	19:33	01:24	02:28	03:35
20°	18:26	18:49	19:16	01:42	02:45	03:49
N 10°	18:16	18:38	19:03	01:59	03:00	04:02
0°	18:07	18:28	18:53	02:14	03:14	04:13
S 10°	17:58	18:19	18:44	02:29	03:28	04:25
20°	17:48	18:11	18:37	02:45	03:42	04:37
30°	17:37	18:02	18:30	03:03	03:59	04:51
35°	17:31	17:57	18:27	03:14	04:09	04:59
40°	17:24	17:52	18:24	03:26	04:20	05:08
45°	17:16	17:46	18:21	03:40	04:33	05:18
S 50°	17:06	17:40	18:17	03:58	04:48	05:31
52°	17:01	17:37	18:16	04:06	04:56	05:37
54°	16:56	17:33	18:15	04:15	05:04	05:43
56°	16:51	17:30	18:14	04:26	05:13	05:51
58°	16:45	17:26	18:12	04:38	05:23	05:59
S 60°	16:38	17:22	18:11	04:51	05:35	06:08
S 62°	16:30	17:17	18:09	05:07	05:49	06:18

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON ◯ Age/ Vis
17	4 08	4 01	12:04	21:00	08:30	11d 82%
18	3 55	3 48	12:04	21:59	09:30	12d 91%
19	3 41	3 34	12:04	22:57	10:28	13d 96%

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2013 August 20, 21, 22 (Tue, Wed, Thur)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
20 Tuesday 00	328° 29'.7	144° 38'.1	1° 03'.4 S	211° 36'.1	22° 02'.2 N	225° 40'.0	22° 46'.4 N	113° 46'.4	11° 26'.7 S
01	343° 32'.2	159° 37'.9	04'.7	226° 36'.8	01'.9	240° 42'.0	46'.4	128° 48'.7	26'.7
02	358° 34'.6	174° 37'.7	06'.0	241° 37'.6	01'.6	255° 43'.9	46'.3	143° 51'.0	26'.8
03	13° 37'.1	189° 37'.5	07'.3	256° 38'.3	01'.4	270° 45'.9	46'.3	158° 53'.3	26'.9
04	28° 39'.6	204° 37'.3	08'.5	271° 39'.0	01'.1	285° 47'.8	46'.2	173° 55'.6	26'.9
05	43° 42'.0	219° 37'.1	09'.8	286° 39'.8	00'.8	300° 49'.8	46'.2	188° 57'.9	27'.0
06	58° 44'.5	234° 36'.9	11'.1	301° 40'.5	00'.5	315° 51'.7	46'.2	204° 00'.2	27'.0
07	73° 46'.9	249° 36'.7	12'.4	316° 41'.3	00'.3	330° 53'.7	46'.1	219° 02'.5	27'.1
08	88° 49'.4	264° 36'.5	13'.7	331° 42'.0	00'.0	345° 55'.6	46'.1	234° 04'.8	27'.2
09	103° 51'.9	279° 36'.3	15'.0	346° 42'.8	21° 59'.7 N	0° 57'.6	46'.1	249° 07'.1	27'.2
10	118° 54'.3	294° 36'.1	16'.3	1° 43'.5	59'.5	15° 59'.5	46'.0	264° 09'.4	27'.3
11	133° 56'.8	309° 35'.9	17'.6	16° 44'.3	59'.2	31° 01'.5	46'.0	279° 11'.8	27'.4
12	148° 59'.3	324° 35'.7	1° 18'.9 S	31° 45'.0	21° 58'.9 N	46° 03'.4	22° 45'.9 N	294° 14'.1	11° 27'.4 S
13	164° 01'.7	339° 35'.5	20'.1	46° 45'.8	58'.7	61° 05'.4	45'.9	309° 16'.4	27'.5
14	179° 04'.2	354° 35'.3	21'.4	61° 46'.5	58'.4	76° 07'.4	45'.9	324° 18'.7	27'.6
15	194° 06'.7	9° 35'.1	22'.7	76° 47'.2	58'.1	91° 09'.3	45'.8	339° 21'.0	27'.6
16	209° 09'.1	24° 34'.9	24'.0	91° 48'.0	57'.8	106° 11'.3	45'.8	354° 23'.3	27'.7
17	224° 11'.6	39° 34'.7	25'.3	106° 48'.7	57'.6	121° 13'.2	45'.7	9° 25'.6	27'.7
18	239° 14'.1	54° 34'.5	26'.6	121° 49'.5	57'.3	136° 15'.2	45'.7	24° 27'.9	27'.8
19	254° 16'.5	69° 34'.3	27'.9	136° 50'.2	57'.0	151° 17'.1	45'.7	39° 30'.2	27'.9
20	269° 19'.0	84° 34'.1	29'.2	151° 51'.0	56'.8	166° 19'.1	45'.6	54° 32'.5	27'.9
21	284° 21'.4	99° 33'.9	30'.5	166° 51'.7	56'.5	181° 21'.0	45'.6	69° 34'.8	28'.0
22	299° 23'.9	114° 33'.8	31'.7	181° 52'.5	56'.2	196° 23'.0	45'.5	84° 37'.1	28'.1
23	314° 26'.4	129° 33'.6	33'.0	196° 53'.2	55'.9	211° 24'.9	45'.5	99° 39'.4	28'.1
21 Wednesday 00	329° 28'.8	144° 33'.4	1° 34'.3 S	211° 54'.0	21° 55'.7 N	226° 26'.9	22° 45'.5 N	114° 41'.7	11° 28'.2 S
01	344° 31'.3	159° 33'.2	35'.6	226° 54'.7	55'.4	241° 28'.8	45'.4	129° 44'.1	28'.2
02	359° 33'.8	174° 33'.0	36'.9	241° 55'.5	55'.1	256° 30'.8	45'.4	144° 46'.4	28'.3
03	14° 36'.2	189° 32'.8	38'.2	256° 56'.2	54'.8	271° 32'.7	45'.4	159° 48'.7	28'.4
04	29° 38'.7	204° 32'.6	39'.5	271° 57'.0	54'.6	286° 34'.7	45'.3	174° 51'.0	28'.4
05	44° 41'.2	219° 32'.4	40'.8	286° 57'.7	54'.3	301° 36'.6	45'.3	189° 53'.3	28'.5
06	59° 43'.6	234° 32'.2	42'.1	301° 58'.5	54'.0	316° 38'.6	45'.2	204° 55'.6	28'.6
07	74° 46'.1	249° 32'.0	43'.4	316° 59'.2	53'.7	331° 40'.5	45'.2	219° 57'.9	28'.6
08	89° 48'.5	264° 31'.8	44'.6	332° 00'.0	53'.5	346° 42'.5	45'.2	235° 00'.2	28'.7
09	104° 51'.0	279° 31'.6	45'.9	347° 00'.7	53'.2	1° 44'.5	45'.1	250° 02'.5	28'.8
10	119° 53'.5	294° 31'.4	47'.2	2° 01'.5	52'.9	16° 46'.4	45'.1	265° 04'.8	28'.8
11	134° 55'.9	309° 31'.2	48'.5	17° 02'.2	52'.6	31° 48'.4	45'.0	280° 07'.1	28'.9
12	149° 58'.4	324° 31'.0	1° 49'.8 S	32° 03'.0	21° 52'.3 N	46° 50'.3	22° 45'.0 N	295° 09'.4	11° 29'.0 S
13	165° 00'.9	339° 30'.8	51'.1	47° 03'.7	52'.1	61° 52'.3	45'.0	310° 11'.7	29'.0
14	180° 03'.3	354° 30'.7	52'.4	62° 04'.5	51'.8	76° 54'.2	44'.9	325° 14'.0	29'.1
15	195° 05'.8	9° 30'.5	53'.7	77° 05'.2	51'.5	91° 56'.2	44'.9	340° 16'.3	29'.1
16	210° 08'.3	24° 30'.3	55'.0	92° 06'.0	51'.2	106° 58'.1	44'.8	355° 18'.6	29'.2
17	225° 10'.7	39° 30'.1	56'.2	107° 06'.7	51'.0	122° 00'.1	44'.8	10° 20'.9	29'.3
18	240° 13'.2	54° 29'.9	57'.5	122° 07'.5	50'.7	137° 02'.0	44'.8	25° 23'.2	29'.3
19	255° 15'.7	69° 29'.7	58'.8	137° 08'.2	50'.4	152° 04'.0	44'.7	40° 25'.5	29'.4
20	270° 18'.1	84° 29'.5	2° 00'.1 S	152° 09'.0	50'.1	167° 06'.0	44'.7	55° 27'.8	29'.5
21	285° 20'.6	99° 29'.3	01'.4	167° 09'.7	49'.8	182° 07'.9	44'.7	70° 30'.2	29'.5
22	300° 23'.0	114° 29'.1	02'.7	182° 10'.5	49'.6	197° 09'.9	44'.6	85° 32'.5	29'.6
23	315° 25'.5	129° 28'.9	04'.0	197° 11'.2	49'.3	212° 11'.8	44'.6	100° 34'.8	29'.7
22 Thursday 00	330° 28'.0	144° 28'.7	2° 05'.3 S	212° 12'.0	21° 49'.0 N	227° 13'.8	22° 44'.5 N	115° 37'.1	11° 29'.7 S
01	345° 30'.4	159° 28'.5	06'.5	227° 12'.7	48'.7	242° 15'.7	44'.5	130° 39'.4	29'.8
02	0° 32'.9	174° 28'.3	07'.8	242° 13'.5	48'.4	257° 17'.7	44'.5	145° 41'.7	29'.9
03	15° 35'.4	189° 28'.1	09'.1	257° 14'.2	48'.2	272° 19'.6	44'.4	160° 44'.0	29'.9
04	30° 37'.8	204° 27'.9	10'.4	272° 15'.0	47'.9	287° 21'.6	44'.4	175° 46'.3	30'.0
05	45° 40'.3	219° 27'.8	11'.7	287° 15'.7	47'.6	302° 23'.6	44'.3	190° 48'.6	30'.0
06	60° 42'.8	234° 27'.6	13'.0	302° 16'.5	47'.3	317° 25'.5	44'.3	205° 50'.9	30'.1
07	75° 45'.2	249° 27'.4	14'.3	317° 17'.2	47'.0	332° 27'.5	44'.3	220° 53'.2	30'.2
08	90° 47'.7	264° 27'.2	15'.6	332° 18'.0	46'.7	347° 29'.4	44'.2	235° 55'.5	30'.2
09	105° 50'.2	279° 27'.0	16'.9	347° 18'.8	46'.5	2° 31'.4	44'.2	250° 57'.8	30'.3
10	120° 52'.6	294° 26'.8	18'.1	2° 19'.5	46'.2	17° 33'.4	44'.1	266° 00'.1	30'.4
11	135° 55'.1	309° 26'.6	19'.4	17° 20'.3	45'.9	32° 35'.3	44'.1	281° 02'.4	30'.4
12	150° 57'.5	324° 26'.4	2° 20'.7 S	32° 21'.0	21° 45'.6 N	47° 37'.3	22° 44'.1 N	296° 04'.7	11° 30'.5 S
13	166° 00'.0	339° 26'.2	22'.0	47° 21'.8	45'.3	62° 39'.2	44'.0	311° 07'.0	30'.6
14	181° 02'.5	354° 26'.0	23'.3	62° 22'.5	45'.0	77° 41'.2	44'.0	326° 09'.3	30'.6
15	196° 04'.9	9° 25'.8	24'.6	77° 23'.3	44'.8	92° 43'.1	43'.9	341° 11'.6	30'.7
16	211° 07'.4	24° 25'.6	25'.9	92° 24'.0	44'.5	107° 45'.1	43'.9	356° 13'.9	30'.8
17	226° 09'.9	39° 25'.4	27'.2	107° 24'.8	44'.2	122° 47'.1	43'.9	11° 16'.2	30'.8
18	241° 12'.3	54° 25'.3	28'.4	122° 25'.5	43'.9	137° 49'.0	43'.8	26° 18'.5	30'.9
19	256° 14'.8	69° 25'.1	29'.7	137° 26'.3	43'.6	152° 51'.0	43'.8	41° 20'.8	31'.0
20	271° 17'.3	84° 24'.9	31'.0	152° 27'.1	43'.3	167° 52'.9	43'.7	56° 23'.1	31'.0
21	286° 19'.7	99° 24'.7	32'.3	167° 27'.8	43'.0	182° 54'.9	43'.7	71° 25'.4	31'.1
22	301° 22'.2	114° 24'.5	33'.6	182° 28'.6	42'.8	197° 56'.9	43'.7	86° 27'.7	31'.2
23	316° 24'.6	129° 24'.3	34'.9	197° 29'.3	42'.5	212° 58'.8	43'.6	101° 30'.0	31'.2
	M.P. 01:58	v -0'.2	d 1'.3	v 0'.8	d 0'.3	v 2'.0	d 0'.0	v 2'.3	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.2	40° 14'.8 S
Achernar	335° 26'.4	57° 09'.8 S
Acrux	173° 09'.6	63° 10'.7 S
Adhara	255° 12'.7	28° 59'.4 S
Aldebaran	290° 49'.3	16° 32'.1 N
Alioth	166° 21'.0	55° 53'.4 N
Alkaid	152° 59'.1	49° 15'.0 N
Alnair	27° 43'.1	46° 53'.4 S
Alnilam	275° 46'.4	1° 11'.6 S
Alphard	217° 56'.3	8° 43'.1 S
Alphecca	126° 10'.9	26° 40'.5 N
Alpheratz	357° 43'.0	29° 10'.0 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.3	42° 13'.6 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.9 N
Atria	107° 27'.5	69° 03'.2 S
Avior	234° 18'.5	59° 33'.2 S
Bellatrix	278° 32'.0	6° 21'.6 N
Betelgeuse	271° 01'.3	7° 24'.5 N
Canopus	263° 56'.4	52° 42'.1 S
Capella	280° 34'.4	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.1 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.5	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.7 N
Elnath	278° 12'.6	28° 36'.9 N
Eltanin	90° 45'.8	51° 29'.7 N
Enif	33° 46'.6	9° 56'.5 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.1	57° 11'.5 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.9	60° 26'.5 S
Hamal	328° 00'.4	23° 31'.6 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 20'.4	74° 06'.3 N
Markab	13° 37'.9	15° 16'.9 N
Menkar	314° 14'.8	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.5 S
Mirfak	308° 40'.0	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 35'.2	89° 19'.0 N
Pollux	243° 27'.9	27° 59'.4 N
Procyon	244° 59'.8	5° 11'.3 N
Rasalhague	96° 06'.2	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.1 S
Rigil Kent	139° 51'.6	60° 53'.6 S
Sabik	102° 12'.2	15° 44'.3 S
Schedar	349° 39'.9	56° 36'.7 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 33'.8	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.3 S
Vega	80° 38'.6	38° 48'.2 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	175° 04'.5	14:22
Mars	242° 25'.1	09:52
Jupiter	256° 58'.0	08:53
Saturn	145° 12'.9	16:19

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
179° 08'.3	12° 27'.5 N	15° 08'.1	7'.0	12° 16'.1 S	10'.0	60'.4
194° 08'.5	26'.7	29° 34'.1	7'.1	06'.1	10'.2	
209° 08'.6	25'.9	44° 00'.2	7'.2	11° 55'.9 S	10'.3	
224° 08'.8	25'.0	58° 26'.4	7'.2	45'.6	10'.3	
239° 08'.9	24'.2	72° 52'.6	7'.3	35'.3	10'.4	
254° 09'.1	23'.4	87° 18'.9	7'.3	24'.9	10'.4	
269° 09'.2	22'.6	101° 45'.2	7'.4	14'.5	10'.6	60'.3
284° 09'.4	21'.7	116° 11'.6	7'.5	03'.9	10'.5	
299° 09'.5	20'.9	130° 38'.1	7'.5	10° 53'.4 S	10'.7	
314° 09'.7	20'.1	145° 04'.6	7'.5	42'.7	10'.7	
329° 09'.8	19'.3	159° 31'.1	7'.7	32'.0	10'.8	
344° 10'.0	18'.4	173° 57'.8	7'.7	21'.2	10'.8	
359° 10'.1	12° 17'.6 N	188° 24'.5	7'.7	10° 10'.4 S	10'.9	60'.3
14° 10'.3	16'.8	202° 51'.2	7'.8	9° 59'.5 S	11'.0	
29° 10'.5	16'.0	217° 18'.0	7'.9	48'.5	11'.0	60'.2
44° 10'.6	15'.1	231° 44'.9	7'.9	37'.5	11'.1	
59° 10'.8	14'.3	246° 11'.8	7'.9	26'.4	11'.1	
74° 10'.9	13'.5	260° 38'.7	8'.1	15'.3	11'.2	
89° 11'.1	12'.6	275° 05'.8	8'.1	04'.1	11'.2	
104° 11'.2	11'.8	289° 32'.9	8'.1	8° 52'.9 S	11'.3	
119° 11'.4	11'.0	304° 00'.0	8'.2	41'.6	11'.3	60'.1
134° 11'.5	10'.2	318° 27'.2	8'.3	30'.3	11'.4	
149° 11'.7	09'.3	332° 54'.5	8'.3	18'.9	11'.4	
164° 11'.8	08'.5	347° 21'.8	8'.3	07'.5	11'.4	
179° 12'.0	12° 07'.7 N	1° 49'.1	8'.5	7° 56'.1 S	11'.5	60'.1
194° 12'.1	06'.8	16° 16'.6	8'.4	44'.6	11'.5	60'.0
209° 12'.3	06'.0	30° 44'.0	8'.6	33'.1	11'.6	
224° 12'.5	05'.2	45° 11'.6	8'.6	21'.5	11'.6	
239° 12'.6	04'.3	59° 39'.2	8'.6	09'.9	11'.7	
254° 12'.8	03'.5	74° 06'.8	8'.7	6° 58'.2 S	11'.6	59'.9
269° 12'.9	02'.7	88° 34'.5	8'.8	46'.6	11'.7	
284° 13'.1	01'.8	103° 02'.3	8'.8	34'.9	11'.8	
299° 13'.2	01'.0	117° 30'.1	8'.8	23'.1	11'.7	
314° 13'.4	00'.2	131° 57'.9	9'.0	11'.4	11'.8	
329° 13'.5	11° 59'.3 N	146° 25'.9	8'.9	5° 59'.6 S	11'.9	59'.8
344° 13'.7	58'.5	160° 53'.8	9'.0	47'.7	11'.8	
359° 13'.9	11° 57'.7 N	175° 21'.8	9'.1	5° 35'.9 S	11'.9	59'.8
14° 14'.0	56'.8	189° 49'.9	9'.1	24'.0	11'.8	
29° 14'.2	56'.0	204° 18'.0	9'.2	12'.2	12'.0	59'.7
44° 14'.3	55'.2	218° 46'.2	9'.2	00'.2	11'.9	
59° 14'.5	54'.3	233° 14'.4	9'.3	4° 48'.3 S	11'.9	
74° 14'.6	53'.5	247° 42'.7	9'.3	36'.4	12'.0	
89° 14'.8	52'.7	262° 11'.0	9'.4	24'.4	12'.0	59'.6
104° 15'.0	51'.8	276° 39'.4	9'.4	12'.4	12'.0	
119° 15'.1	51'.0	291° 07'.8	9'.5	00'.4	12'.0	
134° 15'.3	50'.1	305° 36'.3	9'.5	3° 48'.4 S	12'.0	
149° 15'.4	49'.3	320° 04'.8	9'.6	36'.4	12'.0	59'.5
164° 15'.6	48'.5	334° 33'.4	9'.6	24'.4	12'.0	
179° 15'.8	11° 47'.6 N	349° 02'.0	9'.6	3° 12'.4 S	12'.0	59'.5
194° 15'.9	46'.8	3° 30'.6	9'.7	00'.4	12'.1	59'.4
209° 16'.1	45'.9	17° 59'.3	9'.8	2° 48'.3 S	12'.0	
224° 16'.2	45'.1	32° 28'.1	9'.8	36'.3	12'.1	
239° 16'.4	44'.3	46° 56'.9	9'.8	24'.2	12'.0	
254° 16'.6	43'.4	61° 25'.7	9'.9	12'.2	12'.1	59'.3
269° 16'.7	42'.6	75° 54'.6	9'.9	00'.1	12'.0	
284° 16'.9	41'.7	90° 23'.5	10'.0	1° 48'.1 S	12'.1	
299° 17'.0	40'.9	104° 52'.5	10'.0	36'.0	12'.0	59'.2
314° 17'.2	40'.1	119° 21'.5	10'.1	24'.0	12'.0	
329° 17'.4	39'.2	133° 50'.6	10'.1	12'.0	12'.0	
344° 17'.5	38'.4	148° 19'.7	10'.1	1° 00'.0 S	12'.1	59'.1
359° 17'.7	11° 37'.5 N	162° 48'.8	10'.2	0° 47'.9 S	12'.0	59'.1
14° 17'.8	36'.7	177° 18'.0	10'.2	35'.9	12'.0	
29° 18'.0	35'.8	191° 47'.2	10'.2	23'.9	12'.0	59'.0
44° 18'.2	35'.0	206° 16'.4	10'.3	11'.9	11'.9	
59° 18'.3	34'.2	220° 45'.7	10'.4	0° 00'.0 N	12'.0	
74° 18'.5	33'.3	235° 15'.1	10'.3	12'.0	11'.9	58'.9
89° 18'.6	32'.5	249° 44'.4	10'.4	23'.9	12'.0	
104° 18'.8	31'.6	264° 13'.8	10'.5	35'.9	11'.9	
119° 19'.0	30'.8	278° 43'.3	10'.4	47'.8	11'.9	58'.8
134° 19'.1	29'.9	293° 12'.7	10'.5	59'.7	11'.8	
149° 19'.3	29'.1	307° 42'.2	10'.6	1° 11'.5 N	11'.9	
164° 19'.5	28'.2	322° 11'.8	10'.6	23'.4	11'.8	58'.7
SD 15'.8	d 0'.8	SD	16'.4	16'.3	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 20	Moonrise 21	Moonrise 22
N 72°	-	-	03:03	19:39	19:28	19:18
N 70°	-	01:46	03:27	19:26	19:22	19:18
68°	-	02:25	03:44	19:15	19:17	19:19
66°	-	02:51	03:59	19:06	19:13	19:19
64°	01:33	03:11	04:10	18:58	19:10	19:20
62°	02:08	03:27	04:20	18:52	19:07	19:20
60°	02:32	03:40	04:29	18:46	19:04	19:20
N 58°	02:51	03:51	04:36	18:41	19:02	19:21
56°	03:06	04:01	04:43	18:36	19:00	19:21
54°	03:19	04:09	04:49	18:32	18:58	19:21
52°	03:30	04:17	04:54	18:28	18:56	19:21
50°	03:40	04:24	04:59	18:25	18:54	19:22
45°	03:59	04:38	05:09	18:18	18:51	19:22
N 40°	04:14	04:49	05:17	18:12	18:48	19:22
35°	04:27	04:58	05:25	18:06	18:46	19:23
30°	04:37	05:06	05:31	18:02	18:43	19:23
20°	04:52	05:19	05:42	17:53	18:40	19:24
N 10°	05:04	05:30	05:51	17:46	18:36	19:24
0°	05:14	05:39	06:00	17:40	18:33	19:24
S 10°	05:22	05:47	06:08	17:33	18:30	19:25
20°	05:29	05:55	06:17	17:26	18:27	19:26
30°	05:35	06:03	06:27	17:17	18:23	19:26
35°	05:38	06:07	06:33	17:13	18:21	19:27
40°	05:41	06:12	06:40	17:07	18:18	19:27
45°	05:43	06:17	06:47	17:01	18:15	19:28
S 50°	05:46	06:23	06:57	16:53	18:12	19:28
52°	05:47	06:26	07:01	16:50	18:10	19:29
54°	05:48	06:29	07:05	16:46	18:08	19:29
56°	05:49	06:32	07:10	16:42	18:07	19:29
58°	05:49	06:35	07:16	16:37	18:04	19:30
S 60°	05:50	06:39	07:22	16:32	18:02	19:30
S 62°	05:51	06:43	07:30	16:25	17:59	19:31

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 20	Moonset 21	Moonset 22
N 72°	20:58	23:28	-	02:21	04:31	06:32
N 70°	20:36	22:13	-	02:43	04:42	06:35
68°	20:19	21:37	-	03:00	04:51	06:37
66°	20:05	21:12	23:33	03:14	04:58	06:39
64°	19:54	20:52	22:27	03:25	05:04	06:41
62°	19:44	20:37	21:54	03:35	05:10	06:43
60°	19:36	20:24	21:31	03:43	05:14	06:44
N 58°	19:28	20:13	21:13	03:50	05:18	06:45
56°	19:22	20:04	20:58	03:56	05:22	06:46
54°	19:16	19:55	20:45	04:02	05:25	06:47
52°	19:11	19:48	20:34	04:07	05:28	06:48
50°	19:06	19:41	20:25	04:11	05:31	06:48
45°	18:56	19:28	20:06	04:21	05:36	06:50
N 40°	18:48	19:17	19:51	04:29	05:41	06:51
35°	18:41	19:07	19:39	04:36	05:45	06:52
30°	18:35	19:00	19:29	04:42	05:49	06:53
20°	18:24	18:47	19:13	04:53	05:55	06:55
N 10°	18:15	18:36	19:02	05:02	06:00	06:56
0°	18:06	18:28	18:52	05:10	06:05	06:58
S 10°	17:58	18:19	18:44	05:19	06:10	06:59
20°	17:49	18:12	18:37	05:28	06:15	07:00
30°	17:39	18:03	18:31	05:38	06:21	07:02
35°	17:33	17:59	18:29	05:44	06:25	07:03
40°	17:27	17:55	18:26	05:50	06:28	07:04
45°	17:19	17:49	18:24	05:58	06:33	07:05
S 50°	17:10	17:44	18:21	06:07	06:38	07:06
52°	17:06	17:41	18:20	06:11	06:40	07:07
54°	17:02	17:38	18:20	06:16	06:43	07:07
56°	16:57	17:35	18:19	06:21	06:46	07:08
58°	16:51	17:32	18:18	06:26	06:49	07:09
S 60°	16:45	17:28	18:17	06:33	06:53	07:10
S 62°	16:38	17:24	18:16	06:40	06:57	07:11

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
20	3 27	3 20	12:03	23:52	11:25	14d 99%
21	3 12	3 05	12:03	24:45	12:19	15d Full
22	2 57	2 50	12:03	00:45	13:11	16d 97%

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2013 August 23, 24, 25 (Fri, Sat, Sun)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
23 Friday 00	331° 27'.1	144° 24'.1	2° 36'.2 S	212° 30'.1	21° 42'.2 N	228° 00'.8	22° 43'.6 N	116° 32'.3	11° 31'.3 S
01	346° 29'.6	159° 23'.9	37'.5	227° 30'.8	41'.9	243° 02'.7	43'.5	131° 34'.6	31'.3
02	1° 32'.0	174° 23'.7	38'.7	242° 31'.6	41'.6	258° 04'.7	43'.5	146° 36'.9	31'.4
03	16° 34'.5	189° 23'.5	40'.0	257° 32'.4	41'.3	273° 06'.7	43'.5	161° 39'.2	31'.5
04	31° 37'.0	204° 23'.3	41'.3	272° 33'.1	41'.0	288° 08'.6	43'.4	176° 41'.5	31'.5
05	46° 39'.4	219° 23'.1	42'.6	287° 33'.9	40'.7	303° 10'.6	43'.4	191° 43'.8	31'.6
06	61° 41'.9	234° 23'.0	43'.9	302° 34'.6	40'.5	318° 12'.5	43'.4	206° 46'.1	31'.7
07	76° 44'.4	249° 22'.8	45'.2	317° 35'.4	40'.2	333° 14'.5	43'.3	221° 48'.4	31'.7
08	91° 46'.8	264° 22'.6	46'.5	332° 36'.2	39'.9	348° 16'.5	43'.3	236° 50'.7	31'.8
09	106° 49'.3	279° 22'.4	47'.7	347° 36'.9	39'.6	3° 18'.4	43'.2	251° 53'.0	31'.9
10	121° 51'.8	294° 22'.2	49'.0	2° 37'.7	39'.3	18° 20'.4	43'.2	266° 55'.3	31'.9
11	136° 54'.2	309° 22'.0	50'.3	17° 38'.4	39'.0	33° 22'.3	43'.2	281° 57'.6	32'.0
12	151° 56'.7	324° 21'.8	2° 51'.6 S	32° 39'.2	21° 38'.7 N	48° 24'.3	22° 43'.1 N	296° 59'.9	11° 32'.1 S
13	166° 59'.1	339° 21'.6	52'.9	47° 39'.9	38'.4	63° 26'.3	43'.1	312° 02'.2	32'.1
14	182° 01'.6	354° 21'.4	54'.2	62° 40'.7	38'.1	78° 28'.2	43'.0	327° 04'.5	32'.2
15	197° 04'.1	9° 21'.2	55'.5	77° 41'.5	37'.8	93° 30'.2	43'.0	342° 06'.8	32'.3
16	212° 06'.5	24° 21'.0	56'.8	92° 42'.2	37'.6	108° 32'.2	43'.0	357° 09'.1	32'.3
17	227° 09'.0	39° 20'.8	58'.0	107° 43'.0	37'.3	123° 34'.1	42'.9	12° 11'.4	32'.4
18	242° 11'.5	54° 20'.7	59'.3	122° 43'.7	37'.0	138° 36'.1	42'.9	27° 13'.7	32'.5
19	257° 13'.9	69° 20'.5	3° 00'.6 S	137° 44'.5	36'.7	153° 38'.0	42'.8	42° 16'.0	32'.5
20	272° 16'.4	84° 20'.3	01'.9	152° 45'.3	36'.4	168° 40'.0	42'.8	57° 18'.3	32'.6
21	287° 18'.9	99° 20'.1	03'.2	167° 46'.0	36'.1	183° 42'.0	42'.8	72° 20'.6	32'.7
22	302° 21'.3	114° 19'.9	04'.5	182° 46'.8	35'.8	198° 43'.9	42'.7	87° 22'.9	32'.7
23	317° 23'.8	129° 19'.7	05'.8	197° 47'.6	35'.5	213° 45'.9	42'.7	102° 25'.2	32'.8
24 Saturday 00	332° 26'.2	144° 19'.5	3° 07'.0 S	212° 48'.3	21° 35'.2 N	228° 47'.9	22° 42'.6 N	117° 27'.5	11° 32'.9 S
01	347° 28'.7	159° 19'.3	08'.3	227° 49'.1	34'.9	243° 49'.8	42'.6	132° 29'.8	32'.9
02	2° 31'.2	174° 19'.1	09'.6	242° 49'.8	34'.6	258° 51'.8	42'.6	147° 32'.1	33'.0
03	17° 33'.6	189° 18'.9	10'.9	257° 50'.6	34'.3	273° 53'.8	42'.5	162° 34'.3	33'.1
04	32° 36'.1	204° 18'.7	12'.2	272° 51'.4	34'.0	288° 55'.7	42'.5	177° 36'.6	33'.1
05	47° 38'.6	219° 18'.6	13'.5	287° 52'.1	33'.7	303° 57'.7	42'.4	192° 38'.9	33'.2
06	62° 41'.0	234° 18'.4	14'.8	302° 52'.9	33'.4	318° 59'.7	42'.4	207° 41'.2	33'.3
07	77° 43'.5	249° 18'.2	16'.0	317° 53'.7	33'.2	334° 01'.6	42'.4	222° 43'.5	33'.3
08	92° 46'.0	264° 18'.0	17'.3	332° 54'.4	32'.9	349° 03'.6	42'.3	237° 45'.8	33'.4
09	107° 48'.4	279° 17'.8	18'.6	347° 55'.2	32'.6	4° 05'.5	42'.3	252° 48'.1	33'.5
10	122° 50'.9	294° 17'.6	19'.9	2° 55'.9	32'.3	19° 07'.5	42'.2	267° 50'.4	33'.5
11	137° 53'.4	309° 17'.4	21'.2	17° 56'.7	32'.0	34° 09'.5	42'.2	282° 52'.7	33'.6
12	152° 55'.8	324° 17'.2	3° 22'.5 S	32° 57'.5	21° 31'.7 N	49° 11'.4	22° 42'.2 N	297° 55'.0	11° 33'.7 S
13	167° 58'.3	339° 17'.0	23'.7	47° 58'.2	31'.4	64° 13'.4	42'.1	312° 57'.3	33'.7
14	183° 00'.7	354° 16'.8	25'.0	62° 59'.0	31'.1	79° 15'.4	42'.1	327° 59'.6	33'.8
15	198° 03'.2	9° 16'.6	26'.3	77° 59'.8	30'.8	94° 17'.3	42'.0	343° 01'.9	33'.9
16	213° 05'.7	24° 16'.5	27'.6	93° 00'.5	30'.5	109° 19'.3	42'.0	358° 04'.2	33'.9
17	228° 08'.1	39° 16'.3	28'.9	108° 01'.3	30'.2	124° 21'.3	42'.0	13° 06'.5	34'.0
18	243° 10'.6	54° 16'.1	30'.2	123° 02'.1	29'.9	139° 23'.2	41'.9	28° 08'.8	34'.1
19	258° 13'.1	69° 15'.9	31'.4	138° 02'.8	29'.6	154° 25'.2	41'.9	43° 11'.1	34'.1
20	273° 15'.5	84° 15'.7	32'.7	153° 03'.6	29'.3	169° 27'.2	41'.8	58° 13'.4	34'.2
21	288° 18'.0	99° 15'.5	34'.0	168° 04'.4	29'.0	184° 29'.1	41'.8	73° 15'.7	34'.3
22	303° 20'.5	114° 15'.3	35'.3	183° 05'.1	28'.7	199° 31'.1	41'.8	88° 18'.0	34'.3
23	318° 22'.9	129° 15'.1	36'.6	198° 05'.9	28'.4	214° 33'.1	41'.7	103° 20'.3	34'.4
25 Sunday 00	333° 25'.4	144° 14'.9	3° 37'.9 S	213° 06'.7	21° 28'.1 N	229° 35'.0	22° 41'.7 N	118° 22'.5	11° 34'.5 S
01	348° 27'.8	159° 14'.7	39'.2	228° 07'.4	27'.8	244° 37'.0	41'.6	133° 24'.8	34'.5
02	3° 30'.3	174° 14'.5	40'.4	243° 08'.2	27'.5	259° 39'.0	41'.6	148° 27'.1	34'.6
03	18° 32'.8	189° 14'.4	41'.7	258° 09'.0	27'.2	274° 41'.0	41'.6	163° 29'.4	34'.7
04	33° 35'.2	204° 14'.2	43'.0	273° 09'.7	26'.9	289° 42'.9	41'.5	178° 31'.7	34'.7
05	48° 37'.7	219° 14'.0	44'.3	288° 10'.5	26'.6	304° 44'.9	41'.5	193° 34'.0	34'.8
06	63° 40'.2	234° 13'.8	45'.6	303° 11'.3	26'.3	319° 46'.9	41'.4	208° 36'.3	34'.9
07	78° 42'.6	249° 13'.6	46'.8	318° 12'.0	26'.0	334° 48'.8	41'.4	223° 38'.6	34'.9
08	93° 45'.1	264° 13'.4	48'.1	333° 12'.8	25'.7	349° 50'.8	41'.4	238° 40'.9	35'.0
09	108° 47'.6	279° 13'.2	49'.4	348° 13'.6	25'.4	4° 52'.8	41'.3	253° 43'.2	35'.1
10	123° 50'.0	294° 13'.0	50'.7	3° 14'.3	25'.1	19° 54'.7	41'.3	268° 45'.5	35'.1
11	138° 52'.5	309° 12'.8	52'.0	18° 15'.1	24'.8	34° 56'.7	41'.2	283° 47'.8	35'.2
12	153° 55'.0	324° 12'.6	3° 53'.3 S	33° 15'.9	21° 24'.5 N	49° 58'.7	22° 41'.2 N	298° 50'.1	11° 35'.3 S
13	168° 57'.4	339° 12'.4	54'.5	48° 16'.6	24'.2	65° 00'.6	41'.2	313° 52'.4	35'.3
14	183° 59'.9	354° 12'.3	55'.8	63° 17'.4	23'.9	80° 02'.6	41'.1	328° 54'.6	35'.4
15	199° 02'.3	9° 12'.1	57'.1	78° 18'.2	23'.6	95° 04'.6	41'.1	343° 56'.9	35'.5
16	214° 04'.8	24° 11'.9	58'.4	93° 19'.0	23'.3	110° 06'.6	41'.0	358° 59'.2	35'.6
17	229° 07'.3	39° 11'.7	59'.7	108° 19'.7	23'.0	125° 08'.5	41'.0	14° 01'.5	35'.6
18	244° 09'.7	54° 11'.5	4° 01'.0 S	123° 20'.5	22'.7	140° 10'.5	41'.0	29° 03'.8	35'.7
19	259° 12'.2	69° 11'.3	02'.2	138° 21'.3	22'.4	155° 12'.5	40'.9	44° 06'.1	35'.8
20	274° 14'.7	84° 11'.1	03'.5	153° 22'.0	22'.0	170° 14'.4	40'.9	59° 08'.4	35'.8
21	289° 17'.1	99° 10'.9	04'.8	168° 22'.8	21'.7	185° 16'.4	40'.8	74° 10'.7	35'.9
22	304° 19'.6	114° 10'.7	06'.1	183° 23'.6	21'.4	200° 18'.4	40'.8	89° 13'.0	36'.0
23	319° 22'.1	129° 10'.5	07'.4	198° 24'.3	21'.1	215° 20'.4	40'.7	104° 15'.3	36'.0
	M.P. 01:46	v -0'.2	d 1'.3	v 0'.8	d 0'.3	v 2'.0	d 0'.0	v 2'.3	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.1	40° 14'.8 S
Achernar	335° 26'.4	57° 09'.8 S
Acrux	173° 09'.6	63° 10'.7 S
Adhara	255° 12'.7	28° 59'.4 S
Aldebaran	290° 49'.2	16° 32'.1 N
Alioth	166° 21'.0	55° 53'.3 N
Alkaid	152° 59'.1	49° 15'.0 N
Alnair	27° 43'.1	46° 53'.4 S
Alnilam	275° 46'.3	1° 11'.6 S
Alphard	217° 56'.3	8° 43'.1 S
Alphecca	126° 10'.9	26° 40'.5 N
Alpheratz	357° 43'.0	29° 10'.0 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.6 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.9 N
Atria	107° 27'.5	69° 03'.2 S
Avior	234° 18'.5	59° 33'.2 S
Bellatrix	278° 32'.0	6° 21'.7 N
Betelgeuse	271° 01'.3	7° 24'.5 N
Canopus	263° 56'.4	52° 42'.1 S
Capella	280° 34'.4	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.1 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.5	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.7 N
Elnath	278° 12'.6	28° 36'.9 N
Eltanin	90° 45'.8	51° 29'.7 N
Enif	33° 46'.6	9° 56'.5 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.1	57° 11'.5 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.9	60° 26'.5 S
Hamal	328° 00'.4	23° 31'.6 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 20'.5	74° 06'.3 N
Markab	13° 37'.8	15° 16'.9 N
Menkar	314° 14'.8	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.3 S
Miaplacidus	221° 40'.5	69° 46'.4 S
Mirfak	308° 40'.0	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 33'.9	89° 19'.0 N
Pollux	243° 27'.9	27° 59'.4 N
Procyon	244° 59'.8	5° 11'.3 N
Rasalhague	96° 06'.2	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.1 S
Rigil Kent	139° 51'.6	60° 53'.6 S
Sabik	102° 12'.3	15° 44'.3 S
Schedar	349° 39'.8	56° 36'.7 N
Shaula	96° 21'.5	37° 06'.7 S
Sirius	258° 33'.8	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.3 S
Vega	80° 38'.6	38° 48'.2 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	171° 53'.3	14:23
Mars	240° 22'.1	09:48
Jupiter	256° 21'.6	08:44
Saturn	145° 01'.2	16:08

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
179° 19'.6	11° 27'.4 N	336° 41'.4	10'.6	1° 35'.2 N	11'.8	58'.7
194° 19'.8	26'.5	351° 11'.0	10'.6	47'.0	11'.8	
209° 20'.0	25'.7	5° 40'.6	10'.7	58'.8	11'.7	58'.6
224° 20'.1	24'.9	20° 10'.3	10'.7	2° 10'.5 N	11'.8	
239° 20'.3	24'.0	34° 40'.0	10'.8	22'.3	11'.7	
254° 20'.4	23'.2	49° 09'.8	10'.7	34'.0	11'.6	58'.5
269° 20'.6	22'.3	63° 39'.5	10'.8	45'.6	11'.7	
284° 20'.8	21'.5	78° 09'.3	10'.9	57'.3	11'.6	
299° 20'.9	20'.6	92° 39'.2	10'.8	3° 08'.9 N	11'.6	58'.4
314° 21'.1	19'.8	107° 09'.0	10'.9	20'.5	11'.5	
329° 21'.3	18'.9	121° 38'.9	10'.9	32'.0	11'.5	
344° 21'.4	18'.1	136° 08'.8	11'.0	43'.5	11'.5	58'.3
359° 21'.6	11° 17'.2 N	150° 38'.8	10'.9	3° 55'.0 N	11'.4	58'.3
14° 21'.8	16'.4	165° 08'.7	11'.0	4° 06'.4 N	11'.4	
29° 21'.9	15'.5	179° 38'.7	11'.0	17'.8	11'.4	58'.2
44° 22'.1	14'.7	194° 08'.7	11'.1	29'.2	11'.3	
59° 22'.3	13'.8	208° 38'.8	11'.1	40'.5	11'.3	
74° 22'.4	13'.0	223° 08'.9	11'.1	51'.8	11'.3	58'.1
89° 22'.6	12'.1	237° 39'.0	11'.1	5° 03'.1 N	11'.2	
104° 22'.8	11'.3	252° 09'.1	11'.1	14'.3	11'.1	58'.0
119° 22'.9	10'.4	266° 39'.2	11'.2	25'.4	11'.1	
134° 23'.1	09'.5	281° 09'.4	11'.2	36'.5	11'.1	
149° 23'.3	08'.7	295° 39'.6	11'.2	47'.6	11'.1	57'.9
164° 23'.4	07'.8	310° 09'.8	11'.2	58'.7	10'.9	
179° 23'.6	11° 07'.0 N	324° 40'.0	11'.3	6° 09'.6 N	11'.0	57'.9
194° 23'.8	06'.1	339° 10'.3	11'.2	20'.6	10'.9	57'.8
209° 23'.9	05'.3	353° 40'.5	11'.3	31'.5	10'.8	
224° 24'.1	04'.4	8° 10'.8	11'.3	42'.3	10'.8	
239° 24'.3	03'.6	22° 41'.1	11'.3	53'.1	10'.7	57'.7
254° 24'.5	02'.7	37° 11'.4	11'.4	7° 03'.8 N	10'.7	
269° 24'.6	01'.9	51° 41'.8	11'.3	14'.5	10'.6	
284° 24'.8	01'.0	66° 12'.1	11'.4	25'.1	10'.6	57'.6
299° 25'.0	00'.1	80° 42'.5	11'.4	35'.7	10'.6	
314° 25'.1	10° 59'.3 N	95° 12'.9	11'.4	46'.3	10'.4	57'.5
329° 25'.3	58'.4	109° 43'.3	11'.4	56'.7	10'.4	
344° 25'.5	57'.6	124° 13'.7	11'.5	8° 07'.1 N	10'.4	
359° 25'.6	10° 56'.7 N	138° 44'.2	11'.4	8° 17'.5 N	10'.3	57'.4
14° 25'.8	55'.9	153° 14'.6	11'.5	27'.8	10'.3	
29° 26'.0	55'.0	167° 45'.1	11'.5	38'.1	10'.2	
44° 26'.2	54'.1	182° 15'.6	11'.5	48'.3	10'.1	57'.3
59° 26'.3	53'.3	196° 46'.1	11'.5	58'.4	10'.1	
74° 26'.5	52'.4	211° 16'.6	11'.5	9° 08'.5 N	10'.0	
89° 26'.7	51'.6	225° 47'.1	11'.6	18'.5	9'.9	57'.2
104° 26'.8	50'.7	240° 17'.7	11'.5	28'.4	9'.9	
119° 27'.0	49'.8	254° 48'.2	11'.6	38'.3	9'.8	57'.1
134° 27'.2	49'.0	269° 18'.8	11'.5	48'.1	9'.8	
149° 27'.4	48'.1	283° 49'.3	11'.6	57'.9	9'.7	
164° 27'.5	47'.3	298° 19'.9	11'.6	10° 07'.6 N	9'.6	57'.0
179° 27'.7	10° 46'.4 N	312° 50'.5	11'.6	10° 17'.2 N	9'.6	57'.0
194° 27'.9	45'.5	327° 21'.1	11'.6	26'.8	9'.5	
209° 28'.0	44'.7	341° 51'.7	11'.6	36'.3	9'.5	56'.9
224° 28'.2	43'.8	356° 22'.3	11'.6	45'.8	9'.3	
239° 28'.4	42'.9	10° 52'.9	11'.7	55'.1	9'.3	
254° 28'.6	42'.1	25° 23'.6	11'.6	11° 04'.4 N	9'.3	56'.8
269° 28'.7	41'.2	39° 54'.2	11'.7	13'.7	9'.2	
284° 28'.9	40'.4	54° 24'.9	11'.6	22'.9	9'.1	
299° 29'.1	39'.5	68° 55'.5	11'.7	32'.0	9'.0	56'.7
314° 29'.3	38'.6	83° 26'.2	11'.6	41'.0	8'.9	
329° 29'.4	37'.8	97° 56'.8	11'.7	49'.9	8'.9	
344° 29'.6	36'.9	112° 27'.5	11'.7	58'.8	8'.9	56'.6
359° 29'.8	10° 36'.0 N	126° 58'.2	11'.7	12° 07'.7 N	8'.7	56'.6
14° 30'.0	35'.2	141° 28'.9	11'.7	16'.4	8'.7	56'.5
29° 30'.1	34'.3	155° 59'.6	11'.7	25'.1	8'.6	
44° 30'.3	33'.4	170° 30'.3	11'.7	33'.7	8'.5	
59° 30'.5	32'.6	185° 01'.0	11'.7	42'.2	8'.5	56'.4
74° 30'.7	31'.7	199° 31'.7	11'.7	50'.7	8'.3	
89° 30'.8	30'.8	214° 02'.4	11'.7	59'.0	8'.3	
104° 31'.0	30'.0	228° 33'.1	11'.7	13° 07'.3 N	8'.3	56'.3
119° 31'.2	29'.1	243° 03'.8	11'.8	15'.6	8'.1	
134° 31'.4	28'.2	257° 34'.6	11'.7	23'.7	8'.1	
149° 31'.5	27'.4	272° 05'.3	11'.7	31'.8	8'.0	
164° 31'.7	26'.5	286° 36'.0	11'.7	39'.8	7'.9	56'.2
SD 15'.8	d 0'.9	SD 15'.9		15'.6	15'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 23	Moonrise 24	Moonrise 25
N 72°	-	01:16	03:20	19:08	18:57	18:45
N 70°	-	02:10	03:40	19:15	19:11	19:08
68°	-	02:41	03:56	19:20	19:23	19:26
66°	01:06	03:04	04:09	19:25	19:32	19:41
64°	01:53	03:22	04:19	19:30	19:40	19:53
62°	02:22	03:36	04:28	19:33	19:47	20:04
60°	02:44	03:48	04:36	19:36	19:53	20:13
N 58°	03:00	03:59	04:43	19:39	19:59	20:20
56°	03:14	04:08	04:49	19:42	20:03	20:27
54°	03:26	04:15	04:54	19:44	20:08	20:34
52°	03:37	04:22	04:59	19:46	20:12	20:39
50°	03:45	04:28	05:03	19:48	20:15	20:44
45°	04:04	04:41	05:12	19:52	20:23	20:55
N 40°	04:18	04:52	05:20	19:56	20:29	21:04
35°	04:29	05:01	05:27	19:59	20:35	21:12
30°	04:39	05:08	05:33	20:01	20:40	21:19
20°	04:53	05:20	05:42	20:06	20:49	21:31
N 10°	05:05	05:30	05:51	20:10	20:56	21:42
0°	05:13	05:38	05:59	20:14	21:03	21:52
S 10°	05:21	05:45	06:07	20:18	21:11	22:02
20°	05:27	05:53	06:15	20:23	21:18	22:13
30°	05:32	06:00	06:24	20:28	21:27	22:25
35°	05:34	06:04	06:30	20:31	21:32	22:32
40°	05:36	06:08	06:35	20:34	21:38	22:41
45°	05:38	06:13	06:42	20:38	21:45	22:50
S 50°	05:40	06:18	06:51	20:42	21:54	23:02
52°	05:41	06:20	06:54	20:44	21:57	23:07
54°	05:41	06:22	06:59	20:47	22:02	23:13
56°	05:42	06:25	07:03	20:49	22:06	23:20
58°	05:42	06:28	07:08	20:52	22:12	23:27
S 60°	05:43	06:31	07:14	20:55	22:18	23:36
S 62°	05:43	06:34	07:20	20:59	22:24	23:46

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 23	Moonset 24	Moonset 25
N 72°	20:40	22:37	-	08:29	10:23	12:17
N 70°	20:21	21:49	-	08:24	10:10	11:55
68°	20:06	21:19	-	08:21	10:00	11:38
66°	19:53	20:57	22:48	08:17	09:52	11:24
64°	19:43	20:40	22:06	08:15	09:46	11:13
62°	19:34	20:26	21:39	08:13	09:40	11:03
60°	19:27	20:14	21:18	08:11	09:35	10:55
N 58°	19:20	20:04	21:02	08:09	09:30	10:48
56°	19:15	19:55	20:48	08:07	09:26	10:42
54°	19:09	19:48	20:36	08:06	09:23	10:36
52°	19:05	19:41	20:26	08:05	09:19	10:31
50°	19:00	19:35	20:18	08:04	09:17	10:26
45°	18:51	19:22	20:00	08:01	09:10	10:17
N 40°	18:44	19:12	19:46	07:59	09:05	10:08
35°	18:37	19:03	19:35	07:57	09:00	10:01
30°	18:32	18:56	19:25	07:56	08:56	09:55
20°	18:22	18:44	19:11	07:53	08:50	09:45
N 10°	18:13	18:35	19:00	07:51	08:44	09:35
0°	18:06	18:27	18:51	07:48	08:38	09:27
S 10°	17:58	18:19	18:44	07:46	08:32	09:18
20°	17:50	18:12	18:38	07:44	08:26	09:09
30°	17:41	18:05	18:33	07:41	08:19	08:58
35°	17:36	18:01	18:31	07:39	08:15	08:52
40°	17:30	17:57	18:29	07:38	08:11	08:45
45°	17:23	17:53	18:27	07:35	08:06	08:37
S 50°	17:15	17:48	18:25	07:33	08:00	08:28
52°	17:11	17:46	18:25	07:32	07:57	08:23
54°	17:07	17:43	18:24	07:31	07:54	08:19
56°	17:02	17:41	18:24	07:29	07:50	08:13
58°	16:57	17:38	18:23	07:28	07:47	08:07
S 60°	16:52	17:35	18:23	07:26	07:42	08:00
S 62°	16:45	17:31	18:23	07:24	07:38	07:53

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
23	2 42	2 34	12:03	01:36	14:01	17d 92%
24	2 26	2 18	12:02	02:26	14:51	18d 86%
25	2 10	2 01	12:02	03:15	15:39	19d 77%

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2013 August 26, 27, 28 (Mon, Tue, Wed)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
26 Monday 00	334° 24'.5	144° 10'.3	4° 08'.6 S	213° 25'.1	21° 20'.8 N	230° 22'.3	22° 40'.7 N	119° 17'.6	11° 36'.1 S
01	349° 27'.0	159° 10'.1	09'.9	228° 25'.9	20'.5	245° 24'.3	40'.7	134° 19'.9	36'.2
02	4° 29'.5	174° 10'.0	11'.2	243° 26'.7	20'.2	260° 26'.3	40'.6	149° 22'.1	36'.2
03	19° 31'.9	189° 09'.8	12'.5	258° 27'.4	19'.9	275° 28'.2	40'.6	164° 24'.4	36'.3
04	34° 34'.4	204° 09'.6	13'.8	273° 28'.2	19'.6	290° 30'.2	40'.5	179° 26'.7	36'.4
05	49° 36'.8	219° 09'.4	15'.0	288° 29'.0	19'.3	305° 32'.2	40'.5	194° 29'.0	36'.4
06	64° 39'.3	234° 09'.2	16'.3	303° 29'.8	19'.0	320° 34'.2	40'.5	209° 31'.3	36'.5
07	79° 41'.8	249° 09'.0	17'.6	318° 30'.5	18'.7	335° 36'.1	40'.4	224° 33'.6	36'.6
08	94° 44'.2	264° 08'.8	18'.9	333° 31'.3	18'.4	350° 38'.1	40'.4	239° 35'.9	36'.6
09	109° 46'.7	279° 08'.6	20'.2	348° 32'.1	18'.1	5° 40'.1	40'.3	254° 38'.2	36'.7
10	124° 49'.2	294° 08'.4	21'.4	3° 32'.8	17'.8	20° 42'.1	40'.3	269° 40'.5	36'.8
11	139° 51'.6	309° 08'.2	22'.7	18° 33'.6	17'.4	35° 44'.0	40'.3	284° 42'.7	36'.8
12	154° 54'.1	324° 08'.0	4° 24'.0 S	33° 34'.4	21° 17'.1 N	50° 46'.0	22° 40'.2 N	299° 45'.0	11° 36'.9 S
13	169° 56'.6	339° 07'.9	25'.3	48° 35'.2	16'.8	65° 48'.0	40'.2	314° 47'.3	37'.0
14	184° 59'.0	354° 07'.7	26'.6	63° 35'.9	16'.5	80° 49'.9	40'.1	329° 49'.6	37'.1
15	200° 01'.5	9° 07'.5	27'.8	78° 36'.7	16'.2	95° 51'.9	40'.1	344° 51'.9	37'.1
16	215° 03'.9	24° 07'.3	29'.1	93° 37'.5	15'.9	110° 53'.9	40'.1	359° 54'.2	37'.2
17	230° 06'.4	39° 07'.1	30'.4	108° 38'.3	15'.6	125° 55'.9	40'.0	14° 56'.5	37'.3
18	245° 08'.9	54° 06'.9	31'.7	123° 39'.0	15'.3	140° 57'.8	40'.0	29° 58'.8	37'.3
19	260° 11'.3	69° 06'.7	33'.0	138° 39'.8	15'.0	155° 59'.8	39'.9	45° 01'.1	37'.4
20	275° 13'.8	84° 06'.5	34'.2	153° 40'.6	14'.7	171° 01'.8	39'.9	60° 03'.3	37'.5
21	290° 16'.3	99° 06'.3	35'.5	168° 41'.4	14'.3	186° 03'.8	39'.9	75° 05'.6	37'.5
22	305° 18'.7	114° 06'.1	36'.8	183° 42'.1	14'.0	201° 05'.7	39'.8	90° 07'.9	37'.6
23	320° 21'.2	129° 05'.9	38'.1	198° 42'.9	13'.7	216° 07'.7	39'.8	105° 10'.2	37'.7
27 Tuesday 00	335° 23'.7	144° 05'.7	4° 39'.3 S	213° 43'.7	21° 13'.4 N	231° 09'.7	22° 39'.7 N	120° 12'.5	11° 37'.7 S
01	350° 26'.1	159° 05'.6	40'.6	228° 44'.5	13'.1	246° 11'.7	39'.7	135° 14'.8	37'.8
02	5° 28'.6	174° 05'.4	41'.9	243° 45'.2	12'.8	261° 13'.6	39'.7	150° 17'.1	37'.9
03	20° 31'.1	189° 05'.2	43'.2	258° 46'.0	12'.5	276° 15'.6	39'.6	165° 19'.4	37'.9
04	35° 33'.5	204° 05'.0	44'.5	273° 46'.8	12'.2	291° 17'.6	39'.6	180° 21'.6	38'.0
05	50° 36'.0	219° 04'.8	45'.7	288° 47'.6	11'.8	306° 19'.6	39'.5	195° 23'.9	38'.1
06	65° 38'.4	234° 04'.6	47'.0	303° 48'.4	11'.5	321° 21'.6	39'.5	210° 26'.2	38'.2
07	80° 40'.9	249° 04'.4	48'.3	318° 49'.1	11'.2	336° 23'.5	39'.5	225° 28'.5	38'.2
08	95° 43'.4	264° 04'.2	49'.6	333° 49'.9	10'.9	351° 25'.5	39'.4	240° 30'.8	38'.3
09	110° 45'.8	279° 04'.0	50'.8	348° 50'.7	10'.6	6° 27'.5	39'.4	255° 33'.1	38'.4
10	125° 48'.3	294° 03'.8	52'.1	3° 51'.5	10'.3	21° 29'.5	39'.3	270° 35'.4	38'.4
11	140° 50'.8	309° 03'.6	53'.4	18° 52'.2	10'.0	36° 31'.4	39'.3	285° 37'.7	38'.5
12	155° 53'.2	324° 03'.4	4° 54'.7 S	33° 53'.0	21° 09'.6 N	51° 33'.4	22° 39'.2 N	300° 39'.9	11° 38'.6 S
13	170° 55'.7	339° 03'.2	55'.9	48° 53'.8	09'.3	66° 35'.4	39'.2	315° 42'.2	38'.6
14	185° 58'.2	354° 03'.1	57'.2	63° 54'.6	09'.0	81° 37'.4	39'.2	330° 44'.5	38'.7
15	201° 00'.6	9° 02'.9	58'.5	78° 55'.4	08'.7	96° 39'.4	39'.1	345° 46'.8	38'.8
16	216° 03'.1	24° 02'.7	59'.8	93° 56'.1	08'.4	111° 41'.3	39'.1	0° 49'.1	38'.8
17	231° 05'.6	39° 02'.5	5° 01'.0 S	108° 56'.9	08'.1	126° 43'.3	39'.0	15° 51'.4	38'.9
18	246° 08'.0	54° 02'.3	02'.3	123° 57'.7	07'.7	141° 45'.3	39'.0	30° 53'.7	39'.0
19	261° 10'.5	69° 02'.1	03'.6	138° 58'.5	07'.4	156° 47'.3	39'.0	45° 55'.9	39'.1
20	276° 12'.9	84° 01'.9	04'.9	153° 59'.3	07'.1	171° 49'.2	38'.9	60° 58'.2	39'.1
21	291° 15'.4	99° 01'.7	06'.1	169° 00'.0	06'.8	186° 51'.2	38'.9	76° 00'.5	39'.2
22	306° 17'.9	114° 01'.5	07'.4	184° 00'.8	06'.5	201° 53'.2	38'.8	91° 02'.8	39'.3
23	321° 20'.3	129° 01'.3	08'.7	199° 01'.6	06'.2	216° 55'.2	38'.8	106° 05'.1	39'.3
28 Wednesday 00	336° 22'.8	144° 01'.1	5° 10'.0 S	214° 02'.4	21° 05'.8 N	231° 57'.2	22° 38'.8 N	121° 07'.4	11° 39'.4 S
01	351° 25'.3	159° 00'.9	11'.2	229° 03'.2	05'.5	246° 59'.1	38'.7	136° 09'.7	39'.5
02	6° 27'.7	174° 00'.7	12'.5	244° 03'.9	05'.2	262° 01'.1	38'.7	151° 11'.9	39'.5
03	21° 30'.2	189° 00'.6	13'.8	259° 04'.7	04'.9	277° 03'.1	38'.6	166° 14'.2	39'.6
04	36° 32'.7	204° 00'.4	15'.1	274° 05'.5	04'.6	292° 05'.1	38'.6	181° 16'.5	39'.7
05	51° 35'.1	219° 00'.2	16'.3	289° 06'.3	04'.3	307° 07'.1	38'.6	196° 18'.8	39'.8
06	66° 37'.6	234° 00'.0	17'.6	304° 07'.1	03'.9	322° 09'.1	38'.5	211° 21'.1	39'.8
07	81° 40'.0	248° 59'.8	18'.9	319° 07'.9	03'.6	337° 11'.0	38'.5	226° 23'.4	39'.9
08	96° 42'.5	263° 59'.6	20'.2	334° 08'.6	03'.3	352° 13'.0	38'.4	241° 25'.6	40'.0
09	111° 45'.0	278° 59'.4	21'.4	349° 09'.4	03'.0	7° 15'.0	38'.4	256° 27'.9	40'.0
10	126° 47'.4	293° 59'.2	22'.7	4° 10'.2	02'.7	22° 17'.0	38'.3	271° 30'.2	40'.1
11	141° 49'.9	308° 59'.0	24'.0	19° 11'.0	02'.3	37° 19'.0	38'.3	286° 32'.5	40'.2
12	156° 52'.4	323° 58'.8	5° 25'.3 S	34° 11'.8	21° 02'.0 N	52° 20'.9	22° 38'.3 N	301° 34'.8	11° 40'.2 S
13	171° 54'.8	338° 58'.6	26'.5	49° 12'.6	01'.7	67° 22'.9	38'.2	316° 37'.1	40'.3
14	186° 57'.3	353° 58'.4	27'.8	64° 13'.3	01'.4	82° 24'.9	38'.2	331° 39'.3	40'.4
15	201° 59'.8	8° 58'.2	29'.1	79° 14'.1	01'.0	97° 26'.9	38'.1	346° 41'.6	40'.5
16	217° 02'.2	23° 58'.0	30'.3	94° 14'.9	00'.7	112° 28'.9	38'.1	1° 43'.9	40'.5
17	232° 04'.7	38° 57'.8	31'.6	109° 15'.7	00'.4	127° 30'.9	38'.1	16° 46'.2	40'.6
18	247° 07'.2	53° 57'.7	32'.9	124° 16'.5	00'.1	142° 32'.8	38'.0	31° 48'.5	40'.7
19	262° 09'.6	68° 57'.5	34'.2	139° 17'.3	20° 59'.8 N	157° 34'.8	38'.0	46° 50'.8	40'.7
20	277° 12'.1	83° 57'.3	35'.4	154° 18'.0	59'.4	172° 36'.8	37'.9	61° 53'.0	40'.8
21	292° 14'.5	98° 57'.1	36'.7	169° 18'.8	59'.1	187° 38'.8	37'.9	76° 55'.3	40'.9
22	307° 17'.0	113° 56'.9	38'.0	184° 19'.6	58'.8	202° 40'.8	37'.9	91° 57'.6	41'.0
23	322° 19'.5	128° 56'.7	39'.2	199° 20'.4	58'.5	217° 42'.8	37'.8	106° 59'.9	41'.0
	M.P. 01:34	v -0'.2	d 1'.3	v 0'.8	d 0'.3	v 2'.0	d 0'.0	v 2'.3	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.1	40° 14'.8 S
Achernar	335° 26'.3	57° 09'.8 S
Acrux	173° 09'.6	63° 10'.6 S
Adhara	255° 12'.6	28° 59'.4 S
Aldebaran	290° 49'.2	16° 32'.1 N
Alioth	166° 21'.0	55° 53'.3 N
Alkaid	152° 59'.1	49° 15'.0 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.3	1° 11'.6 S
Alphard	217° 56'.2	8° 43'.1 S
Alphecca	126° 10'.9	26° 40'.5 N
Alpheratz	357° 43'.0	29° 10'.1 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.6 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.5	69° 03'.2 S
Avior	234° 18'.5	59° 33'.2 S
Bellatrix	278° 31'.9	6° 21'.7 N
Betelgeuse	271° 01'.3	7° 24'.5 N
Canopus	263° 56'.4	52° 42'.0 S
Capella	280° 34'.3	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.1 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.5	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.6 N
Elnath	278° 12'.5	28° 36'.9 N
Eltanin	90° 45'.8	51° 29'.7 N
Enif	33° 46'.6	9° 56'.5 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.1	57° 11'.5 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 47'.9	60° 26'.5 S
Hamal	328° 00'.4	23° 31'.6 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 20'.5	74° 06'.3 N
Markab	13° 37'.8	15° 16'.9 N
Menkar	314° 14'.8	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.3 S
Miaplacidus	221° 40'.4	69° 46'.4 S
Mirfak	308° 40'.0	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 32'.4	89° 19'.0 N
Pollux	243° 27'.8	27° 59'.4 N
Procyon	244° 59'.8	5° 11'.3 N
Rasalhague	96° 06'.2	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.1 S
Rigil Kent	139° 51'.7	60° 53'.6 S
Sabik	102° 12'.3	15° 44'.3 S
Schedar	349° 39'.8	56° 36'.7 N
Shaula	96° 21'.6	37° 06'.7 S
Sirius	258° 33'.8	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.3 S
Vega	80° 38'.6	38° 48'.2 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	168° 42'.1	14:24
Mars	238° 20'.0	09:45
Jupiter	255° 46'.0	08:34
Saturn	144° 48'.8	15:57

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
26 00	179° 31'.9	10° 25'.6 N	301° 06'.7	11'.8	13° 47'.7 N	7'.9	56'.2
01	194° 32'.1	24'.8	315° 37'.5	11'.7	55'.6	7'.8	
02	209° 32'.2	23'.9	330° 08'.2	11'.8	14° 03'.4 N	7'.6	56'.1
03	224° 32'.4	23'.0	344° 39'.0	11'.7	11'.0	7'.7	
04	239° 32'.6	22'.2	359° 09'.7	11'.7	18'.7	7'.5	
05	254° 32'.8	21'.3	13° 40'.4	11'.8	26'.2	7'.4	56'.0
06	269° 32'.9	20'.4	28° 11'.2	11'.7	33'.6	7'.4	
07	284° 33'.1	19'.5	42° 41'.9	11'.8	41'.0	7'.3	
08	299° 33'.3	18'.7	57° 12'.7	11'.7	48'.3	7'.2	55'.9
09	314° 33'.5	17'.8	71° 43'.4	11'.8	55'.5	7'.2	
10	329° 33'.7	16'.9	86° 14'.2	11'.7	15° 02'.7 N	7'.0	
11	344° 33'.8	16'.1	100° 44'.9	11'.8	09'.7	7'.0	55'.8
12	359° 34'.0	10° 15'.2 N	115° 15'.7	11'.7	15° 16'.7 N	6'.9	55'.8
13	14° 34'.2	14'.3	129° 46'.4	11'.8	23'.6	6'.8	
14	29° 34'.4	13'.4	144° 17'.2	11'.7	30'.4	6'.7	
15	44° 34'.5	12'.6	158° 47'.9	11'.8	37'.1	6'.6	55'.7
16	59° 34'.7	11'.7	173° 18'.7	11'.8	43'.7	6'.6	
17	74° 34'.9	10'.8	187° 49'.5	11'.7	50'.3	6'.4	
18	89° 35'.1	10'.0	202° 20'.2	11'.8	56'.7	6'.4	55'.6
19	104° 35'.3	09'.1	216° 51'.0	11'.7	16° 03'.1 N	6'.3	
20	119° 35'.4	08'.2	231° 21'.7	11'.8	09'.4	6'.2	
21	134° 35'.6	07'.3	245° 52'.5	11'.7	15'.6	6'.2	
22	149° 35'.8	06'.5	260° 23'.2	11'.8	21'.8	6'.0	55'.5
23	164° 36'.0	05'.6	274° 54'.0	11'.7	27'.8	6'.0	
27 00	179° 36'.2	10° 04'.7 N	289° 24'.7	11'.8	16° 33'.8 N	5'.8	55'.5
01	194° 36'.3	03'.8	303° 55'.5	11'.8	39'.6	5'.8	55'.4
02	209° 36'.5	03'.0	318° 26'.3	11'.7	45'.4	5'.7	
03	224° 36'.7	02'.1	332° 57'.0	11'.8	51'.1	5'.6	
04	239° 36'.9	01'.2	347° 27'.8	11'.7	56'.7	5'.6	
05	254° 37'.1	00'.3	1° 58'.5	11'.8	17° 02'.3 N	5'.4	55'.3
06	269° 37'.2	9° 59'.4 N	16° 29'.3	11'.7	07'.7	5'.3	
07	284° 37'.4	58'.6	31° 00'.0	11'.8	13'.0	5'.3	
08	299° 37'.6	57'.7	45° 30'.8	11'.7	18'.3	5'.2	
09	314° 37'.8	56'.8	60° 01'.5	11'.8	23'.5	5'.1	55'.2
10	329° 38'.0	55'.9	74° 32'.3	11'.7	28'.6	5'.0	
11	344° 38'.2	55'.1	89° 03'.0	11'.8	33'.6	4'.9	
12	359° 38'.3	9° 54'.2 N	103° 33'.8	11'.7	17° 38'.5 N	4'.8	55'.2
13	14° 38'.5	53'.3	118° 04'.5	11'.8	43'.3	4'.7	55'.1
14	29° 38'.7	52'.4	132° 35'.3	11'.7	48'.0	4'.7	
15	44° 38'.9	51'.5	147° 06'.0	11'.8	52'.7	4'.5	
16	59° 39'.1	50'.7	161° 36'.8	11'.8	57'.2	4'.5	
17	74° 39'.3	49'.8	176° 07'.6	11'.7	18° 01'.7 N	4'.3	55'.0
18	89° 39'.4	48'.9	190° 38'.3	11'.8	06'.0	4'.3	
19	104° 39'.6	48'.0	205° 09'.1	11'.7	10'.3	4'.2	
20	119° 39'.8	47'.1	219° 39'.8	11'.8	14'.5	4'.1	
21	134° 40'.0	46'.3	234° 10'.6	11'.7	18'.6	4'.0	
22	149° 40'.2	45'.4	248° 41'.3	11'.8	22'.6	4'.0	54'.9
23	164° 40'.4	44'.5	263° 12'.1	11'.7	26'.6	3'.8	
28 00	179° 40'.5	9° 43'.6 N	277° 42'.8	11'.8	18° 30'.4 N	3'.7	54'.9
01	194° 40'.7	42'.7	292° 13'.6	11'.8	34'.1	3'.7	
02	209° 40'.9	41'.8	306° 44'.4	11'.7	37'.8	3'.5	
03	224° 41'.1	41'.0	321° 15'.1	11'.8	41'.3	3'.5	54'.8
04	239° 41'.3	40'.1	335° 45'.9	11'.7	44'.8	3'.4	
05	254° 41'.5	39'.2	350° 16'.6	11'.8	48'.2	3'.2	
06	269° 41'.6	38'.3	4° 47'.4	11'.8	51'.4	3'.2	
07	284° 41'.8	37'.4	19° 18'.2	11'.7	54'.6	3'.1	
08	299° 42'.0	36'.5	33° 48'.9	11'.8	57'.7	3'.0	54'.7
09	314° 42'.2	35'.7	48° 19'.7	11'.8	19° 00'.7 N	3'.0	
10	329° 42'.4	34'.8	62° 50'.5	11'.8	03'.7	2'.8	
11	344° 42'.6	33'.9	77° 21'.3	11'.7	06'.5	2'.7	
12	359° 42'.8	9° 33'.0 N	91° 52'.0	11'.8	19° 09'.2 N	2'.6	54'.7
13	14° 42'.9	32'.1	106° 22'.8	11'.8	11'.8	2'.6	
14	29° 43'.1	31'.2	120° 53'.6	11'.8	14'.4	2'.4	54'.6
15	44° 43'.3	30'.4	135° 24'.4	11'.8	16'.8	2'.4	
16	59° 43'.5	29'.5	149° 55'.2	11'.8	19'.2	2'.3	
17	74° 43'.7	28'.6	164° 26'.0	11'.8	21'.5	2'.2	
18	89° 43'.9	27'.7	178° 56'.8	11'.8	23'.7	2'.0	
19	104° 44'.1	26'.8	193° 27'.6	11'.8	25'.7	2'.0	
20	119° 44'.2	25'.9	207° 58'.4	11'.8	27'.7	1'.9	54'.5
21	134° 44'.4	25'.0	222° 29'.2	11'.8	29'.6	1'.8	
22	149° 44'.6	24'.1	237° 00'.0	11'.8	31'.4	1'.7	
23	164° 44'.8	23'.3	251° 30'.8	11'.8	33'.1	1'.7	
	SD 15'.8	d 0'.9	SD 15'.2		15'.0	14'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 26	Moonrise 27	Moonrise 28
N 72°	-	01:51	03:36	18:27	17:31	-
N 70°	-	02:30	03:54	19:06	19:05	19:08
68°	-	02:57	04:08	19:33	19:44	20:06
66°	01:35	03:17	04:19	19:54	20:12	20:41
64°	02:11	03:33	04:28	20:10	20:33	21:05
62°	02:36	03:46	04:36	20:24	20:50	21:25
60°	02:54	03:57	04:43	20:36	21:05	21:41
N 58°	03:10	04:06	04:49	20:46	21:17	21:54
56°	03:22	04:14	04:55	20:55	21:27	22:06
54°	03:33	04:21	04:59	21:03	21:37	22:16
52°	03:43	04:28	05:04	21:10	21:45	22:26
50°	03:51	04:33	05:08	21:16	21:52	22:34
45°	04:08	04:45	05:16	21:30	22:08	22:51
N 40°	04:21	04:55	05:23	21:42	22:22	23:05
35°	04:32	05:03	05:29	21:51	22:33	23:17
30°	04:41	05:10	05:34	22:00	22:43	23:28
20°	04:54	05:21	05:43	22:15	23:00	23:46
N 10°	05:05	05:30	05:51	22:28	23:15	24:02
0°	05:13	05:37	05:58	22:40	23:29	24:17
S 10°	05:19	05:44	06:05	22:53	23:43	24:32
20°	05:25	05:50	06:13	23:06	23:57	24:48
30°	05:29	05:57	06:21	23:21	-	00:15
35°	05:31	06:00	06:26	23:30	-	00:25
40°	05:32	06:04	06:31	23:40	-	00:36
45°	05:33	06:07	06:37	23:52	-	00:50
S 50°	05:34	06:12	06:45	-	00:06	01:06
52°	05:35	06:14	06:48	-	00:13	01:14
54°	05:35	06:16	06:52	-	00:21	01:23
56°	05:35	06:18	06:56	-	00:29	01:33
58°	05:35	06:20	07:00	-	00:39	01:44
S 60°	05:35	06:23	07:05	-	00:50	01:57
S 62°	05:34	06:26	07:11	-	01:03	02:12

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 26	Moonset 27	Moonset 28
N 72°	20:23	22:04	-	14:16	16:53	-
N 70°	20:06	21:27	-	13:38	15:20	16:57
68°	19:53	21:02	23:25	13:12	14:41	15:59
66°	19:42	20:43	22:20	12:52	14:13	15:25
64°	19:33	20:27	21:47	12:36	13:53	15:00
62°	19:25	20:15	21:24	12:23	13:36	14:41
60°	19:18	20:04	21:06	12:11	13:22	14:25
N 58°	19:12	19:55	20:51	12:02	13:10	14:12
56°	19:07	19:47	20:38	11:53	13:00	14:00
54°	19:02	19:40	20:28	11:46	12:51	13:50
52°	18:58	19:34	20:18	11:39	12:43	13:41
50°	18:54	19:28	20:10	11:33	12:36	13:33
45°	18:46	19:17	19:54	11:20	12:20	13:16
N 40°	18:39	19:07	19:41	11:09	12:07	13:02
35°	18:33	18:59	19:30	11:00	11:57	12:50
30°	18:28	18:53	19:22	10:52	11:47	12:40
20°	18:19	18:42	19:08	10:38	11:31	12:22
N 10°	18:12	18:33	18:58	10:26	11:17	12:06
0°	18:05	18:26	18:50	10:15	11:03	11:52
S 10°	17:58	18:19	18:44	10:04	10:50	11:37
20°	17:51	18:13	18:39	09:52	10:36	11:22
30°	17:42	18:07	18:34	09:38	10:20	11:04
35°	17:38	18:03	18:33	09:30	10:11	10:54
40°	17:32	18:00	18:31	09:21	10:00	10:42
45°	17:26	17:56	18:30	09:11	09:47	10:28
S 50°	17:19	17:52	18:29	08:58	09:32	10:11
52°	17:16	17:50	18:29	08:52	09:25	10:03
54°	17:12	17:48	18:29	08:46	09:17	09:54
56°	17:08	17:46	18:29	08:39	09:09	09:44
58°	17:04	17:44	18:29	08:31	08:59	09:33
S 60°	16:59	17:41	18:30	08:21	08:47	09:20
S 62°	16:53	17:39	18:30	08:11	08:34	09:04

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
26	1 53	1 44	12:02	04:03	16:28	20d 68%
27	1 36	1 27	12:01	04:52	17:16	21d 59%
28	1 18	1 09	12:01	05:40	18:04	22d 49%

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2013 August 29, 30, 31 (Thur, Fri, Saw)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
29 Thursday 00	337° 21'.9	143° 56'.5	5° 40'.5 S	214° 21'.2	20° 58'.1 N	232° 44'.7	22° 37'.8 N	122° 02'.2	11° 41'.1 S
01	352° 24'.4	158° 56'.3	41'.8	229° 22'.0	57'.8	247° 46'.7	37'.7	137° 04'.4	41'.2
02	7° 26'.9	173° 56'.1	43'.0	244° 22'.8	57'.5	262° 48'.7	37'.7	152° 06'.7	41'.2
03	22° 29'.3	188° 55'.9	44'.3	259° 23'.5	57'.2	277° 50'.7	37'.7	167° 09'.0	41'.3
04	37° 31'.8	203° 55'.7	45'.6	274° 24'.3	56'.8	292° 52'.7	37'.6	182° 11'.3	41'.4
05	52° 34'.3	218° 55'.5	46'.9	289° 25'.1	56'.5	307° 54'.7	37'.6	197° 13'.6	41'.4
06	67° 36'.7	233° 55'.3	48'.1	304° 25'.9	56'.2	322° 56'.6	37'.5	212° 15'.8	41'.5
07	82° 39'.2	248° 55'.1	49'.4	319° 26'.7	55'.9	337° 58'.6	37'.5	227° 18'.1	41'.6
08	97° 41'.7	263° 54'.9	50'.7	334° 27'.5	55'.5	353° 00'.6	37'.4	242° 20'.4	41'.7
09	112° 44'.1	278° 54'.7	51'.9	349° 28'.3	55'.2	8° 02'.6	37'.4	257° 22'.7	41'.7
10	127° 46'.6	293° 54'.5	53'.2	4° 29'.1	54'.9	23° 04'.6	37'.4	272° 25'.0	41'.8
11	142° 49'.0	308° 54'.3	54'.5	19° 29'.8	54'.6	38° 06'.6	37'.3	287° 27'.3	41'.9
12	157° 51'.5	323° 54'.2	5° 55'.7 S	34° 30'.6	20° 54'.2 N	53° 08'.6	22° 37'.3 N	302° 29'.5	11° 41'.9 S
13	172° 54'.0	338° 54'.0	57'.0	49° 31'.4	53'.9	68° 10'.5	37'.2	317° 31'.8	42'.0
14	187° 56'.4	353° 53'.8	58'.3	64° 32'.2	53'.6	83° 12'.5	37'.2	332° 34'.1	42'.1
15	202° 58'.9	8° 53'.6	59'.5	79° 33'.0	53'.3	98° 14'.5	37'.2	347° 36'.4	42'.2
16	218° 01'.4	23° 53'.4	6° 00'.8 S	94° 33'.8	52'.9	113° 16'.5	37'.1	2° 38'.7	42'.2
17	233° 03'.8	38° 53'.2	02'.1	109° 34'.6	52'.6	128° 18'.5	37'.1	17° 40'.9	42'.3
18	248° 06'.3	53° 53'.0	03'.3	124° 35'.4	52'.3	143° 20'.5	37'.0	32° 43'.2	42'.4
19	263° 08'.8	68° 52'.8	04'.6	139° 36'.2	51'.9	158° 22'.5	37'.0	47° 45'.5	42'.4
20	278° 11'.2	83° 52'.6	05'.9	154° 36'.9	51'.6	173° 24'.5	37'.0	62° 47'.8	42'.5
21	293° 13'.7	98° 52'.4	07'.1	169° 37'.7	51'.3	188° 26'.4	36'.9	77° 50'.0	42'.6
22	308° 16'.1	113° 52'.2	08'.4	184° 38'.5	51'.0	203° 28'.4	36'.9	92° 52'.3	42'.7
23	323° 18'.6	128° 52'.0	09'.7	199° 39'.3	50'.6	218° 30'.4	36'.8	107° 54'.6	42'.7
30 Friday 00	338° 21'.1	143° 51'.8	6° 10'.9 S	214° 40'.1	20° 50'.3 N	233° 32'.4	22° 36'.8 N	122° 56'.9	11° 42'.8 S
01	353° 23'.5	158° 51'.6	12'.2	229° 40'.9	50'.0	248° 34'.4	36'.7	137° 59'.2	42'.9
02	8° 26'.0	173° 51'.4	13'.5	244° 41'.7	49'.6	263° 36'.4	36'.7	153° 01'.4	42'.9
03	23° 28'.5	188° 51'.2	14'.7	259° 42'.5	49'.3	278° 38'.4	36'.7	168° 03'.7	43'.0
04	38° 30'.9	203° 51'.0	16'.0	274° 43'.3	49'.0	293° 40'.4	36'.6	183° 06'.0	43'.1
05	53° 33'.4	218° 50'.8	17'.3	289° 44'.1	48'.6	308° 42'.4	36'.6	198° 08'.3	43'.2
06	68° 35'.9	233° 50'.6	18'.5	304° 44'.9	48'.3	323° 44'.3	36'.5	213° 10'.6	43'.2
07	83° 38'.3	248° 50'.4	19'.8	319° 45'.7	48'.0	338° 46'.3	36'.5	228° 12'.8	43'.3
08	98° 40'.8	263° 50'.2	21'.1	334° 46'.4	47'.6	353° 48'.3	36'.5	243° 15'.1	43'.4
09	113° 43'.3	278° 50'.0	22'.3	349° 47'.2	47'.3	8° 50'.3	36'.4	258° 17'.4	43'.4
10	128° 45'.7	293° 49'.8	23'.6	4° 48'.0	47'.0	23° 52'.3	36'.4	273° 19'.7	43'.5
11	143° 48'.2	308° 49'.6	24'.9	19° 48'.8	46'.7	38° 54'.3	36'.3	288° 21'.9	43'.6
12	158° 50'.6	323° 49'.5	6° 26'.1 S	34° 49'.6	20° 46'.3 N	53° 56'.3	22° 36'.3 N	303° 24'.2	11° 43'.7 S
13	173° 53'.1	338° 49'.3	27'.4	49° 50'.4	46'.0	68° 58'.3	36'.3	318° 26'.5	43'.7
14	188° 55'.6	353° 49'.1	28'.7	64° 51'.2	45'.7	84° 00'.3	36'.2	333° 28'.8	43'.8
15	203° 58'.0	8° 48'.9	29'.9	79° 52'.0	45'.3	99° 02'.3	36'.2	348° 31'.1	43'.9
16	219° 00'.5	23° 48'.7	31'.2	94° 52'.8	45'.0	114° 04'.2	36'.1	3° 33'.3	44'.0
17	234° 03'.0	38° 48'.5	32'.4	109° 53'.6	44'.7	129° 06'.2	36'.1	18° 35'.6	44'.0
18	249° 05'.4	53° 48'.3	33'.7	124° 54'.4	44'.3	144° 08'.2	36'.0	33° 37'.9	44'.1
19	264° 07'.9	68° 48'.1	35'.0	139° 55'.2	44'.0	159° 10'.2	36'.0	48° 40'.2	44'.2
20	279° 10'.4	83° 47'.9	36'.2	154° 56'.0	43'.7	174° 12'.2	36'.0	63° 42'.4	44'.2
21	294° 12'.8	98° 47'.7	37'.5	169° 56'.8	43'.3	189° 14'.2	35'.9	78° 44'.7	44'.3
22	309° 15'.3	113° 47'.5	38'.8	184° 57'.6	43'.0	204° 16'.2	35'.9	93° 47'.0	44'.4
23	324° 17'.8	128° 47'.3	40'.0	199° 58'.4	42'.6	219° 18'.2	35'.8	108° 49'.3	44'.5
31 Saturday 00	339° 20'.2	143° 47'.1	6° 41'.3 S	214° 59'.1	20° 42'.3 N	234° 20'.2	22° 35'.8 N	123° 51'.5	11° 44'.5 S
01	354° 22'.7	158° 46'.9	42'.5	229° 59'.9	42'.0	249° 22'.2	35'.8	138° 53'.8	44'.6
02	9° 25'.1	173° 46'.7	43'.8	245° 00'.7	41'.6	264° 24'.2	35'.7	153° 56'.1	44'.7
03	24° 27'.6	188° 46'.5	45'.1	260° 01'.5	41'.3	279° 26'.2	35'.7	168° 58'.4	44'.7
04	39° 30'.1	203° 46'.3	46'.3	275° 02'.3	41'.0	294° 28'.2	35'.6	184° 00'.6	44'.8
05	54° 32'.5	218° 46'.1	47'.6	290° 03'.1	40'.6	309° 30'.2	35'.6	199° 02'.9	44'.9
06	69° 35'.0	233° 45'.9	48'.8	305° 03'.9	40'.3	324° 32'.1	35'.5	214° 05'.2	45'.0
07	84° 37'.5	248° 45'.7	50'.1	320° 04'.7	40'.0	339° 34'.1	35'.5	229° 07'.5	45'.0
08	99° 39'.9	263° 45'.5	51'.4	335° 05'.5	39'.6	354° 36'.1	35'.5	244° 09'.7	45'.1
09	114° 42'.4	278° 45'.3	52'.6	350° 06'.3	39'.3	9° 38'.1	35'.4	259° 12'.0	45'.2
10	129° 44'.9	293° 45'.1	53'.9	5° 07'.1	38'.9	24° 40'.1	35'.4	274° 14'.3	45'.3
11	144° 47'.3	308° 44'.9	55'.1	20° 07'.9	38'.6	39° 42'.1	35'.3	289° 16'.6	45'.3
12	159° 49'.8	323° 44'.7	6° 56'.4 S	35° 08'.7	20° 38'.3 N	54° 44'.1	22° 35'.3 N	304° 18'.8	11° 45'.4 S
13	174° 52'.3	338° 44'.5	57'.7	50° 09'.5	37'.9	69° 46'.1	35'.3	319° 21'.1	45'.5
14	189° 54'.7	353° 44'.3	58'.9	65° 10'.3	37'.6	84° 48'.1	35'.2	334° 23'.4	45'.5
15	204° 57'.2	8° 44'.1	7° 00'.2 S	80° 11'.1	37'.2	99° 50'.1	35'.2	349° 25'.7	45'.6
16	219° 59'.6	23° 43'.9	01'.4	95° 11'.9	36'.9	114° 52'.1	35'.1	4° 27'.9	45'.7
17	235° 02'.1	38° 43'.7	02'.7	110° 12'.7	36'.6	129° 54'.1	35'.1	19° 30'.2	45'.8
18	250° 04'.6	53° 43'.5	03'.9	125° 13'.5	36'.2	144° 56'.1	35'.1	34° 32'.5	45'.8
19	265° 07'.0	68° 43'.3	05'.2	140° 14'.3	35'.9	159° 58'.1	35'.0	49° 34'.8	45'.9
20	280° 09'.5	83° 43'.1	06'.5	155° 15'.1	35'.6	175° 00'.1	35'.0	64° 37'.0	46'.0
21	295° 12'.0	98° 42'.9	07'.7	170° 15'.9	35'.2	190° 02'.1	34'.9	79° 39'.3	46'.1
22	310° 14'.4	113° 42'.7	09'.0	185° 16'.7	34'.9	205° 04'.1	34'.9	94° 41'.6	46'.1
23	325° 16'.9	128° 42'.5	10'.2	200° 17'.5	34'.5	220° 06'.1	34'.8	109° 43'.8	46'.2
	M.P. 01:22	v -0'.2	d 1'.3	v 0'.8	d 0'.3	v 2'.0	d 0'.0	v 2'.3	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.1	40° 14'.8 S
Achernar	335° 26'.3	57° 09'.8 S
Acrux	173° 09'.7	63° 10'.6 S
Adhara	255° 12'.6	28° 59'.4 S
Aldebaran	290° 49'.2	16° 32'.1 N
Alioth	166° 21'.0	55° 53'.3 N
Alkaid	152° 59'.1	49° 15'.0 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.3	1° 11'.6 S
Alphard	217° 56'.2	8° 43'.1 S
Alphecca	126° 11'.0	26° 40'.5 N
Alpheratz	357° 43'.0	29° 10'.1 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.7 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.6	69° 03'.2 S
Avior	234° 18'.5	59° 33'.2 S
Bellatrix	278° 31'.9	6° 21'.7 N
Betelgeuse	271° 01'.2	7° 24'.5 N
Canopus	263° 56'.3	52° 42'.0 S
Capella	280° 34'.3	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.1 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.5	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.6 N
Elnath	278° 12'.5	28° 36'.9 N
Eltanin	90° 45'.9	51° 29'.7 N
Enif	33° 46'.6	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.1	57° 11'.5 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 48'.0	60° 26'.5 S
Hamal	328° 00'.4	23° 31'.6 N
Kaus Aust.	83° 43'.4	34° 22'.5 S
Kochab	137° 20'.6	74° 06'.3 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.8	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.3 S
Miaplacidus	221° 40'.4	69° 46'.4 S
Mirfak	308° 40'.0	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 30'.9	89° 19'.0 N
Pollux	243° 27'.8	27° 59'.4 N
Procyon	244° 59'.8	5° 11'.3 N
Rasalhague	96° 06'.2	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 12'.0	8° 11'.1 S
Rigil Kent	139° 51'.7	60° 53'.6 S
Sabik	102° 12'.3	15° 44'.3 S
Schedar	349° 39'.8	56° 36'.7 N
Shaula	96° 21'.6	37° 06'.7 S
Sirius	258° 33'.8	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.3 S
Vega	80° 38'.6	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	165° 30'.7	14:25
Mars	236° 19'.0	09:41
Jupiter	255° 11'.3	08:25
Saturn	144° 35'.8	15:46

	SUN		MOON				
	GHA	Dec	GHA	v	Dec	d	HP
29 00	179° 45'.0	9° 22'.4 N	266° 01'.6	11'.9	19° 34'.8 N	1'.5	54'.5
01	194° 45'.2	21'.5	280° 32'.5	11'.8	36'.3	1'.4	
02	209° 45'.4	20'.6	295° 03'.3	11'.8	37'.7	1'.4	
03	224° 45'.6	19'.7	309° 34'.1	11'.9	39'.1	1'.2	54'.4
04	239° 45'.7	18'.8	324° 05'.0	11'.8	40'.3	1'.2	
05	254° 45'.9	17'.9	338° 35'.8	11'.9	41'.5	1'.0	
06	269° 46'.1	17'.0	353° 06'.7	11'.9	42'.5	1'.0	
07	284° 46'.3	16'.1	7° 37'.6	11'.8	43'.5	0'.9	
08	299° 46'.5	15'.3	22° 08'.4	11'.9	44'.4	0'.8	
09	314° 46'.7	14'.4	36° 39'.3	11'.9	45'.2	0'.7	
10	329° 46'.9	13'.5	51° 10'.2	11'.9	45'.9	0'.6	
11	344° 47'.1	12'.6	65° 41'.1	11'.9	46'.5	0'.5	54'.3
12	359° 47'.3	9° 11'.7 N	80° 12'.0	11'.9	19° 47'.0 N	0'.4	54'.3
13	14° 47'.4	10'.8	94° 42'.9	11'.9	47'.4	0'.3	
14	29° 47'.6	09'.9	109° 13'.8	11'.9	47'.7	0'.3	
15	44° 47'.8	09'.0	123° 44'.7	11'.9	48'.0	0'.1	
16	59° 48'.0	08'.1	138° 15'.6	12'.0	48'.1	0'.1	
17	74° 48'.2	07'.2	152° 46'.6	11'.9	48'.2	0'.1	
18	89° 48'.4	06'.3	167° 17'.5	12'.0	48'.1	0'.1	
19	104° 48'.6	05'.4	181° 48'.5	12'.0	48'.0	0'.2	
20	119° 48'.8	04'.5	196° 19'.5	11'.9	47'.8	0'.4	
21	134° 49'.0	03'.7	210° 50'.4	12'.0	47'.4	0'.4	
22	149° 49'.2	02'.8	225° 21'.4	12'.0	47'.0	0'.5	54'.2
23	164° 49'.3	01'.9	239° 52'.4	12'.0	46'.5	0'.6	
30 00	179° 49'.5	9° 01'.0 N	254° 23'.4	12'.0	19° 45'.9 N	0'.7	54'.2
01	194° 49'.7	00'.1	268° 54'.4	12'.1	45'.2	0'.7	
02	209° 49'.9	8° 59'.2 N	283° 25'.5	12'.0	44'.5	0'.9	
03	224° 50'.1	58'.3	297° 56'.5	12'.0	43'.6	1'.0	
04	239° 50'.3	57'.4	312° 27'.5	12'.1	42'.6	1'.0	
05	254° 50'.5	56'.5	326° 58'.6	12'.1	41'.6	1'.1	
06	269° 50'.7	55'.6	341° 29'.7	12'.1	40'.5	1'.3	
07	284° 50'.9	54'.7	356° 00'.8	12'.1	39'.2	1'.3	
08	299° 51'.1	53'.8	10° 31'.9	12'.1	37'.9	1'.4	
09	314° 51'.3	52'.9	25° 03'.0	12'.1	36'.5	1'.5	
10	329° 51'.4	52'.0	39° 34'.1	12'.1	35'.0	1'.6	
11	344° 51'.6	51'.1	54° 05'.2	12'.2	33'.4	1'.7	
12	359° 51'.8	8° 50'.2 N	68° 36'.4	12'.1	19° 31'.7 N	1'.8	54'.2
13	14° 52'.0	49'.3	83° 07'.5	12'.2	29'.9	1'.8	
14	29° 52'.2	48'.4	97° 38'.7	12'.2	28'.1	2'.0	
15	44° 52'.4	47'.5	112° 09'.9	12'.2	26'.1	2'.0	
16	59° 52'.6	46'.6	126° 41'.1	12'.2	24'.1	2'.1	
17	74° 52'.8	45'.7	141° 12'.3	12'.2	22'.0	2'.2	
18	89° 53'.0	44'.8	155° 43'.5	12'.2	19'.8	2'.3	
19	104° 53'.2	43'.9	170° 14'.7	12'.3	17'.5	2'.4	
20	119° 53'.4	43'.0	184° 46'.0	12'.3	15'.1	2'.5	
21	134° 53'.6	42'.1	199° 17'.3	12'.2	12'.6	2'.6	
22	149° 53'.8	41'.2	213° 48'.5	12'.3	10'.0	2'.6	
23	164° 54'.0	40'.3	228° 19'.8	12'.4	07'.4	2'.8	
31 00	179° 54'.2	8° 39'.4 N	242° 51'.2	12'.3	19° 04'.6 N	2'.8	54'.2
01	194° 54'.3	38'.5	257° 22'.5	12'.3	01'.8	2'.9	
02	209° 54'.5	37'.6	271° 53'.8	12'.4	18° 58'.9 N	3'.0	
03	224° 54'.7	36'.7	286° 25'.2	12'.4	55'.9	3'.1	
04	239° 54'.9	35'.8	300° 56'.6	12'.3	52'.8	3'.2	
05	254° 55'.1	34'.9	315° 27'.9	12'.5	49'.6	3'.3	
06	269° 55'.3	34'.0	329° 59'.4	12'.4	46'.3	3'.3	
07	284° 55'.5	33'.1	344° 30'.8	12'.4	43'.0	3'.4	
08	299° 55'.7	32'.2	359° 02'.2	12'.5	39'.6	3'.6	
09	314° 55'.9	31'.3	13° 33'.7	12'.4	36'.0	3'.6	
10	329° 56'.1	30'.4	28° 05'.1	12'.5	32'.4	3'.7	
11	344° 56'.3	29'.5	42° 36'.6	12'.5	28'.7	3'.7	
12	359° 56'.5	8° 28'.6 N	57° 08'.1	12'.5	18° 25'.0 N	3'.9	54'.2
13	14° 56'.7	27'.7	71° 39'.6	12'.6	21'.1	3'.9	
14	29° 56'.9	26'.8	86° 11'.2	12'.5	17'.2	4'.1	
15	44° 57'.1	25'.9	100° 42'.7	12'.6	13'.1	4'.1	
16	59° 57'.3	25'.0	115° 14'.3	12'.6	09'.0	4'.2	
17	74° 57'.5	24'.1	129° 45'.9	12'.6	04'.8	4'.2	
18	89° 57'.7	23'.2	144° 17'.5	12'.6	00'.6	4'.4	
19	104° 57'.9	22'.3	158° 49'.1	12'.7	17° 56'.2 N	4'.4	
20	119° 58'.1	21'.4	173° 20'.8	12'.6	51'.8	4'.5	
21	134° 58'.3	20'.5	187° 52'.4	12'.7	47'.3	4'.6	
22	149° 58'.5	19'.6	202° 24'.1	12'.7	42'.7	4'.7	
23	164° 58'.6	18'.7	216° 55'.8	12'.7	38'.0	4'.8	
	SD 15'.8	d 0'.9	SD 14'.8		14'.8	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 29	Moonrise 30	Moonrise 31
N 72°	-	02:17	03:52	-	-	21:14
N 70°	-	02:49	04:07	19:35	20:53	22:29
68°	01:11	03:11	04:19	20:47	21:49	23:07
66°	01:58	03:29	04:29	21:23	22:22	23:33
64°	02:27	03:43	04:37	21:49	22:46	23:53
62°	02:48	03:55	04:44	22:10	23:05	24:10
60°	03:05	04:05	04:50	22:26	23:21	24:23
N 58°	03:19	04:13	04:56	22:40	23:34	24:35
56°	03:30	04:21	05:00	22:52	23:45	24:45
54°	03:40	04:27	05:05	23:03	23:55	24:54
52°	03:49	04:33	05:09	23:12	-	00:04
50°	03:57	04:38	05:12	23:20	-	00:12
45°	04:12	04:49	05:20	23:38	-	00:29
N 40°	04:25	04:58	05:26	23:53	-	00:43
35°	04:34	05:05	05:31	-	00:05	00:55
30°	04:43	05:11	05:36	-	00:16	01:05
20°	04:55	05:22	05:44	-	00:34	01:23
N 10°	05:05	05:30	05:51	00:02	00:50	01:38
0°	05:12	05:36	05:57	00:17	01:05	01:53
S 10°	05:18	05:42	06:04	00:32	01:20	02:07
20°	05:22	05:48	06:10	00:48	01:36	02:22
30°	05:26	05:53	06:18	01:06	01:54	02:40
35°	05:27	05:56	06:22	01:17	02:05	02:50
40°	05:28	05:59	06:26	01:29	02:17	03:02
45°	05:28	06:02	06:32	01:43	02:32	03:16
S 50°	05:28	06:06	06:38	02:01	02:50	03:32
52°	05:28	06:07	06:41	02:09	02:58	03:40
54°	05:28	06:09	06:45	02:19	03:08	03:49
56°	05:28	06:11	06:48	02:29	03:18	03:59
58°	05:27	06:12	06:52	02:41	03:30	04:10
S 60°	05:26	06:14	06:57	02:55	03:44	04:23
S 62°	05:26	06:17	07:02	03:12	04:01	04:38

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 29	Moonset 30	Moonset 31
N 72°	20:06	21:38	-	-	-	19:50
N 70°	19:51	21:08	-	18:10	18:31	18:33
68°	19:40	20:46	22:40	16:59	17:36	17:55
66°	19:30	20:29	21:58	16:22	17:02	17:29
64°	19:22	20:15	21:30	15:56	16:38	17:08
62°	19:15	20:04	21:10	15:36	16:19	16:51
60°	19:09	19:54	20:54	15:19	16:03	16:37
N 58°	19:04	19:46	20:40	15:05	15:49	16:25
56°	18:59	19:39	20:29	14:53	15:38	16:15
54°	18:55	19:33	20:19	14:42	15:28	16:06
52°	18:51	19:27	20:11	14:33	15:19	15:58
50°	18:48	19:22	20:03	14:25	15:10	15:50
45°	18:41	19:11	19:48	14:07	14:53	15:34
N 40°	18:35	19:02	19:36	13:53	14:39	15:21
35°	18:29	18:55	19:26	13:40	14:27	15:10
30°	18:25	18:49	19:18	13:30	14:17	15:01
20°	18:17	18:39	19:05	13:11	13:59	14:44
N 10°	18:10	18:31	18:56	12:55	13:43	14:29
0°	18:04	18:25	18:49	12:40	13:28	14:15
S 10°	17:58	18:19	18:43	12:25	13:13	14:02
20°	17:51	18:13	18:39	12:09	12:57	13:47
30°	17:44	18:08	18:36	11:50	12:39	13:30
35°	17:40	18:05	18:35	11:40	12:29	13:20
40°	17:35	18:03	18:34	11:27	12:16	13:08
45°	17:30	17:59	18:34	11:13	12:02	12:55
S 50°	17:23	17:56	18:34	10:55	11:44	12:39
52°	17:21	17:55	18:34	10:47	11:36	12:31
54°	17:17	17:53	18:34	10:37	11:27	12:22
56°	17:14	17:52	18:35	10:27	11:16	12:13
58°	17:10	17:50	18:35	10:14	11:04	12:02
S 60°	17:06	17:48	18:36	10:00	10:50	11:49
S 62°	17:01	17:46	18:37	09:44	10:34	11:34

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
29	1 00	0 51	12:01	06:28	18:53	23d 40%
30	0 42	0 33	12:01	07:16	19:40	24d 31%
31	0 24	0 14	12:00	08:04	20:27	25d 22%

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2013 September 1, 2, 3 (Sun, Mon, Tue)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.0		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
1 Sunday 00	340° 19'.4	143° 42'.3	7° 11'.5 S	215° 18'.3	20° 34'.2 N	235° 08'.1	22° 34'.8 N	124° 46'.1	11° 46'.3 S
01	355° 21'.8	158° 42'.1	12'.7	230° 19'.1	33'.8	250° 10'.1	34'.8	139° 48'.4	46'.3
02	10° 24'.3	173° 41'.9	14'.0	245° 19'.9	33'.5	265° 12'.1	34'.7	154° 50'.7	46'.4
03	25° 26'.7	188° 41'.7	15'.3	260° 20'.7	33'.2	280° 14'.1	34'.7	169° 52'.9	46'.5
04	40° 29'.2	203° 41'.5	16'.5	275° 21'.5	32'.8	295° 16'.1	34'.6	184° 55'.2	46'.6
05	55° 31'.7	218° 41'.3	17'.8	290° 22'.3	32'.5	310° 18'.1	34'.6	199° 57'.5	46'.6
06	70° 34'.1	233° 41'.1	19'.0	305° 23'.1	32'.1	325° 20'.1	34'.6	214° 59'.8	46'.7
07	85° 36'.6	248° 40'.9	20'.3	320° 23'.9	31'.8	340° 22'.1	34'.5	230° 02'.0	46'.8
08	100° 39'.1	263° 40'.7	21'.5	335° 24'.7	31'.5	355° 24'.0	34'.5	245° 04'.3	46'.9
09	115° 41'.5	278° 40'.5	22'.8	350° 25'.5	31'.1	10° 26'.0	34'.4	260° 06'.6	46'.9
10	130° 44'.0	293° 40'.3	24'.0	5° 26'.3	30'.8	25° 28'.0	34'.4	275° 08'.8	47'.0
11	145° 46'.5	308° 40'.1	25'.3	20° 27'.1	30'.4	40° 30'.0	34'.3	290° 11'.1	47'.1
12	160° 48'.9	323° 39'.9	7° 26'.5 S	35° 27'.9	20° 30'.1 N	55° 32'.0	22° 34'.3 N	305° 13'.4	11° 47'.2 S
13	175° 51'.4	338° 39'.7	27'.8	50° 28'.7	29'.7	70° 34'.0	34'.3	320° 15'.7	47'.2
14	190° 53'.9	353° 39'.5	29'.0	65° 29'.5	29'.4	85° 36'.0	34'.2	335° 17'.9	47'.3
15	205° 56'.3	8° 39'.3	30'.3	80° 30'.3	29'.0	100° 38'.0	34'.2	350° 20'.2	47'.4
16	220° 58'.8	23° 39'.1	31'.5	95° 31'.1	28'.7	115° 40'.0	34'.1	5° 22'.5	47'.5
17	236° 01'.2	38° 38'.9	32'.8	110° 32'.0	28'.4	130° 42'.0	34'.1	20° 24'.7	47'.5
18	251° 03'.7	53° 38'.7	34'.1	125° 32'.8	28'.0	145° 44'.0	34'.1	35° 27'.0	47'.6
19	266° 06'.2	68° 38'.5	35'.3	140° 33'.6	27'.7	160° 46'.0	34'.0	50° 29'.3	47'.7
20	281° 08'.6	83° 38'.3	36'.6	155° 34'.4	27'.3	175° 48'.0	34'.0	65° 31'.6	47'.7
21	296° 11'.1	98° 38'.1	37'.8	170° 35'.2	27'.0	190° 50'.0	33'.9	80° 33'.8	47'.8
22	311° 13'.6	113° 37'.9	39'.1	185° 36'.0	26'.6	205° 52'.1	33'.9	95° 36'.1	47'.9
23	326° 16'.0	128° 37'.7	40'.3	200° 36'.8	26'.3	220° 54'.1	33'.8	110° 38'.4	48'.0
2 Monday 00	341° 18'.5	143° 37'.5	7° 41'.6 S	215° 37'.6	20° 25'.9 N	235° 56'.1	22° 33'.8 N	125° 40'.6	11° 48'.0 S
01	356° 21'.0	158° 37'.2	42'.8	230° 38'.4	25'.6	250° 58'.1	33'.8	140° 42'.9	48'.1
02	11° 23'.4	173° 37'.0	44'.1	245° 39'.2	25'.2	266° 00'.1	33'.7	155° 45'.2	48'.2
03	26° 25'.9	188° 36'.8	45'.3	260° 40'.0	24'.9	281° 02'.1	33'.7	170° 47'.4	48'.3
04	41° 28'.4	203° 36'.6	46'.6	275° 40'.8	24'.5	296° 04'.1	33'.6	185° 49'.7	48'.3
05	56° 30'.8	218° 36'.4	47'.8	290° 41'.6	24'.2	311° 06'.1	33'.6	200° 52'.0	48'.4
06	71° 33'.3	233° 36'.2	49'.1	305° 42'.4	23'.8	326° 08'.1	33'.6	215° 54'.3	48'.5
07	86° 35'.7	248° 36'.0	50'.3	320° 43'.2	23'.5	341° 10'.1	33'.5	230° 56'.5	48'.6
08	101° 38'.2	263° 35'.8	51'.6	335° 44'.0	23'.2	356° 12'.1	33'.5	245° 58'.8	48'.6
09	116° 40'.7	278° 35'.6	52'.8	350° 44'.8	22'.8	11° 14'.1	33'.4	261° 01'.1	48'.7
10	131° 43'.1	293° 35'.4	54'.0	5° 45'.7	22'.5	26° 16'.1	33'.4	276° 03'.3	48'.8
11	146° 45'.6	308° 35'.2	55'.3	20° 46'.5	22'.1	41° 18'.1	33'.4	291° 05'.6	48'.9
12	161° 48'.1	323° 35'.0	7° 56'.5 S	35° 47'.3	20° 21'.8 N	56° 20'.1	22° 33'.3 N	306° 07'.9	11° 48'.9 S
13	176° 50'.5	338° 34'.8	57'.8	50° 48'.1	21'.4	71° 22'.1	33'.3	321° 10'.1	49'.0
14	191° 53'.0	353° 34'.6	59'.0	65° 48'.9	21'.1	86° 24'.1	33'.2	336° 12'.4	49'.1
15	206° 55'.5	8° 34'.4	8° 00'.3 S	80° 49'.7	20'.7	101° 26'.1	33'.2	351° 14'.7	49'.2
16	221° 57'.9	23° 34'.2	01'.5	95° 50'.5	20'.4	116° 28'.1	33'.1	6° 16'.9	49'.2
17	237° 00'.4	38° 34'.0	02'.8	110° 51'.3	20'.0	131° 30'.1	33'.1	21° 19'.2	49'.3
18	252° 02'.8	53° 33'.8	04'.0	125° 52'.1	19'.7	146° 32'.1	33'.1	36° 21'.5	49'.4
19	267° 05'.3	68° 33'.6	05'.3	140° 52'.9	19'.3	161° 34'.1	33'.0	51° 23'.7	49'.5
20	282° 07'.8	83° 33'.4	06'.5	155° 53'.7	19'.0	176° 36'.1	33'.0	66° 26'.0	49'.5
21	297° 10'.2	98° 33'.2	07'.8	170° 54'.6	18'.6	191° 38'.1	32'.9	81° 28'.3	49'.6
22	312° 12'.7	113° 32'.9	09'.0	185° 55'.4	18'.2	206° 40'.1	32'.9	96° 30'.5	49'.7
23	327° 15'.2	128° 32'.7	10'.2	200° 56'.2	17'.9	221° 42'.1	32'.9	111° 32'.8	49'.8
3 Tuesday 00	342° 17'.6	143° 32'.5	8° 11'.5 S	215° 57'.0	20° 17'.5 N	236° 44'.2	22° 32'.8 N	126° 35'.1	11° 49'.8 S
01	357° 20'.1	158° 32'.3	12'.7	230° 57'.8	17'.2	251° 46'.2	32'.8	141° 37'.4	49'.9
02	12° 22'.6	173° 32'.1	14'.0	245° 58'.6	16'.8	266° 48'.2	32'.7	156° 39'.6	50'.0
03	27° 25'.0	188° 31'.9	15'.2	260° 59'.4	16'.5	281° 50'.2	32'.7	171° 41'.9	50'.1
04	42° 27'.5	203° 31'.7	16'.5	276° 00'.2	16'.1	296° 52'.2	32'.6	186° 44'.1	50'.1
05	57° 30'.0	218° 31'.5	17'.7	291° 01'.0	15'.8	311° 54'.2	32'.6	201° 46'.4	50'.2
06	72° 32'.4	233° 31'.3	18'.9	306° 01'.9	15'.4	326° 56'.2	32'.6	216° 48'.7	50'.3
07	87° 34'.9	248° 31'.1	20'.2	321° 02'.7	15'.1	341° 58'.2	32'.5	231° 51'.0	50'.3
08	102° 37'.3	263° 30'.9	21'.4	336° 03'.5	14'.7	357° 00'.2	32'.5	246° 53'.2	50'.4
09	117° 39'.8	278° 30'.7	22'.7	351° 04'.3	14'.4	12° 02'.2	32'.4	261° 55'.5	50'.5
10	132° 42'.3	293° 30'.5	23'.9	6° 05'.1	14'.0	27° 04'.2	32'.4	276° 57'.7	50'.6
11	147° 44'.7	308° 30'.3	25'.2	21° 05'.9	13'.7	42° 06'.2	32'.4	292° 00'.0	50'.6
12	162° 47'.2	323° 30'.0	8° 26'.4 S	36° 06'.7	20° 13'.3 N	57° 08'.2	22° 32'.3 N	307° 02'.3	11° 50'.7 S
13	177° 49'.7	338° 29'.8	27'.6	51° 07'.5	12'.9	72° 10'.2	32'.3	322° 04'.5	50'.8
14	192° 52'.1	353° 29'.6	28'.9	66° 08'.4	12'.6	87° 12'.3	32'.2	337° 06'.8	50'.9
15	207° 54'.6	8° 29'.4	30'.1	81° 09'.2	12'.2	102° 14'.3	32'.2	352° 09'.1	50'.9
16	222° 57'.1	23° 29'.2	31'.4	96° 10'.0	11'.9	117° 16'.3	32'.1	7° 11'.3	51'.0
17	237° 59'.5	38° 29'.0	32'.6	111° 10'.8	11'.5	132° 18'.3	32'.1	22° 13'.6	51'.1
18	253° 02'.0	53° 28'.8	33'.8	126° 11'.6	11'.2	147° 20'.3	32'.1	37° 15'.9	51'.2
19	268° 04'.4	68° 28'.6	35'.1	141° 12'.4	10'.8	162° 22'.3	32'.0	52° 18'.1	51'.3
20	283° 06'.9	83° 28'.4	36'.3	156° 13'.2	10'.5	177° 24'.3	32'.0	67° 20'.4	51'.3
21	298° 09'.4	98° 28'.2	37'.6	171° 14'.1	10'.1	192° 26'.3	31'.9	82° 22'.7	51'.4
22	313° 11'.8	113° 28'.0	38'.8	186° 14'.9	09'.7	207° 28'.3	31'.9	97° 24'.9	51'.5
23	328° 14'.3	128° 27'.7	40'.0	201° 15'.7	09'.4	222° 30'.3	31'.9	112° 27'.2	51'.6
	M.P. 01:11	v -0'.2	d 1'.2	v 0'.8	d 0'.3	v 2'.0	d 0'.0	v 2'.3	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.1	40° 14'.8 S
Achernar	335° 26'.3	57° 09'.8 S
Acrux	173° 09'.7	63° 10'.6 S
Adhara	255° 12'.6	28° 59'.4 S
Aldebaran	290° 49'.2	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.3 N
Alkaid	152° 59'.1	49° 15'.0 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.3	1° 11'.6 S
Alphard	217° 56'.2	8° 43'.1 S
Alphecca	126° 11'.0	26° 40'.5 N
Alpheratz	357° 43'.0	29° 10'.1 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.7 S
Antares	112° 26'.0	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.6	69° 03'.2 S
Avior	234° 18'.4	59° 33'.1 S
Bellatrix	278° 31'.9	6° 21'.7 N
Betelgeuse	271° 01'.2	7° 24'.5 N
Canopus	263° 56'.3	52° 42'.0 S
Capella	280° 34'.3	46° 00'.4 N
Deneb	49° 30'.9	45° 20'.1 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.6 N
Elnath	278° 12'.5	28° 36'.9 N
Eltanin	90° 45'.9	51° 29'.7 N
Enif	33° 46'.6	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.7 S
Gacrux	172° 01'.2	57° 11'.5 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 48'.0	60° 26'.5 S
Hamal	328° 00'.3	23° 31'.6 N
Kaus Aust.	83° 43'.4	34° 22'.6 S
Kochab	137° 20'.6	74° 06'.3 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.7	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.3 S
Miaplacidus	221° 40'.4	69° 46'.4 S
Mirfak	308° 39'.9	49° 54'.3 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.3 S
Polaris	317° 29'.6	89° 19'.1 N
Pollux	243° 27'.8	27° 59'.4 N
Procyon	244° 59'.8	5° 11'.3 N
Rasalhague	96° 06'.2	12° 33'.3 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 11'.9	8° 11'.1 S
Rigil Kent	139° 51'.7	60° 53'.6 S
Sabik	102° 12'.3	15° 44'.3 S
Schedar	349° 39'.8	56° 36'.7 N
Shaula	96° 21'.6	37° 06'.7 S
Sirius	258° 33'.7	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.3 S
Vega	80° 38'.6	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	162° 19'.0	14:26
Mars	234° 19'.1	09:37
Jupiter	254° 37'.6	08:15
Saturn	144° 22'.1	15:35

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
1 Sunday 00	179° 58'.8	8° 17'.7 N	231° 27'.5	12'.7	17° 33'.2 N	4'.8	54'.2
01	194° 59'.0	16'.8	245° 59'.2	12'.8	28'.4	4'.9	
02	209° 59'.2	15'.9	260° 31'.0	12'.7	23'.5	5'.0	
03	224° 59'.4	15'.0	275° 02'.7	12'.8	18'.5	5'.1	54'.3
04	239° 59'.6	14'.1	289° 34'.5	12'.8	13'.4	5'.2	
05	254° 59'.8	13'.2	304° 06'.3	12'.8	08'.2	5'.2	
06	270° 00'.0	12'.3	318° 38'.1	12'.8	03'.0	5'.3	
07	285° 00'.2	11'.4	333° 09'.9	12'.9	16° 57'.7 N	5'.4	
08	300° 00'.4	10'.5	347° 41'.8	12'.9	52'.3	5'.5	
09	315° 00'.6	09'.6	2° 13'.7	12'.8	46'.8	5'.6	
10	330° 00'.8	08'.7	16° 45'.5	12'.9	41'.2	5'.6	
11	345° 01'.0	07'.8	31° 17'.4	13'.0	35'.6	5'.7	
12	0° 01'.2	8° 06'.9 N	45° 49'.4	12'.9	16° 29'.9 N	5'.8	54'.3
13	15° 01'.4	05'.9	60° 21'.3	13'.0	24'.1	5'.8	
14	30° 01'.6	05'.0	74° 53'.3	12'.9	18'.3	5'.9	
15	45° 01'.8	04'.1	89° 25'.2	13'.0	12'.4	6'.1	54'.4
16	60° 02'.0	03'.2	103° 57'.2	13'.0	06'.3	6'.0	
17	75° 02'.2	02'.3	118° 29'.2	13'.0	00'.3	6'.2	
18	90° 02'.4	01'.4	133° 01'.2	13'.1	15° 54'.1 N	6'.2	
19	105° 02'.6	00'.5	147° 33'.3	13'.0	47'.9	6'.3	
20	120° 02'.8	7° 59'.6 N	162° 05'.3	13'.1	41'.6	6'.4	
21	135° 03'.0	58'.7	176° 37'.4	13'.1	35'.2	6'.4	
22	150° 03'.2	57'.8	191° 09'.5	13'.1	28'.8	6'.5	
23	165° 03'.4	56'.8	205° 41'.6	13'.1	22'.3	6'.6	
2 Monday 00	180° 03'.6	7° 55'.9 N	220° 13'.7	13'.2	15° 15'.7 N	6'.7	54'.4
01	195° 03'.8	55'.0	234° 45'.9	13'.1	09'.0	6'.7	54'.5
02	210° 04'.0	54'.1	249° 18'.0	13'.2	02'.3	6'.8	
03	225° 04'.2	53'.2	263° 50'.2	13'.2	14° 55'.5 N	6'.9	
04	240° 04'.4	52'.3	278° 22'.4	13'.2	48'.6	6'.9	
05	255° 04'.6	51'.4	292° 54'.6	13'.2	41'.7	7'.0	
06	270° 04'.8	50'.5	307° 26'.8	13'.3	34'.7	7'.1	
07	285° 05'.0	49'.5	321° 59'.1	13'.2	27'.6	7'.1	
08	300° 05'.2	48'.6	336° 31'.3	13'.3	20'.5	7'.3	
09	315° 05'.4	47'.7	351° 03'.6	13'.3	13'.2	7'.2	54'.6
10	330° 05'.6	46'.8	5° 35'.9	13'.3	06'.0	7'.4	
11	345° 05'.8	45'.9	20° 08'.2	13'.3	13° 58'.6 N	7'.4	
12	0° 06'.0	7° 45'.0 N	34° 40'.5	13'.3	13° 51'.2 N	7'.5	54'.6
13	15° 06'.2	44'.1	49° 12'.8	13'.4	43'.7	7'.5	
14	30° 06'.4	43'.1	63° 45'.2	13'.3	36'.2	7'.6	
15	45° 06'.6	42'.2	78° 17'.5	13'.4	28'.6	7'.7	
16	60° 06'.8	41'.3	92° 49'.9	13'.4	20'.9	7'.7	54'.7
17	75° 07'.0	40'.4	107° 22'.3	13'.4	13'.2	7'.8	
18	90° 07'.2	39'.5	121° 54'.7	13'.4	05'.4	7'.8	
19	105° 07'.4	38'.6	136° 27'.1	13'.4	12° 57'.6 N	8'.0	
20	120° 07'.6	37'.7	150° 59'.5	13'.5	49'.6	7'.9	
21	135° 07'.8	36'.7	165° 32'.0	13'.4	41'.7	8'.1	
22	150° 08'.0	35'.8	180° 04'.4	13'.5	33'.6	8'.1	
23	165° 08'.2	34'.9	194° 36'.9	13'.4	25'.5	8'.1	54'.8
3 Tuesday 00	180° 08'.4	7° 34'.0 N	209° 09'.3	13'.5	12° 17'.4 N	8'.3	54'.8
01	195° 08'.6	33'.1	223° 41'.8	13'.5	09'.1	8'.2	
02	210° 08'.9	32'.2	238° 14'.3	13'.5	00'.9	8'.4	
03	225° 09'.1	31'.2	252° 46'.8	13'.6	11° 52'.5 N	8'.4	
04	240° 09'.3	30'.3	267° 19'.4	13'.5	44'.1	8'.4	
05	255° 09'.5	29'.4	281° 51'.9	13'.5	35'.7	8'.5	54'.9
06	270° 09'.7	28'.5	296° 24'.4	13'.6	27'.2	8'.6	
07	285° 09'.9	27'.6	310° 57'.0	13'.6	18'.6	8'.6	
08	300° 10'.1	26'.6	325° 29'.6	13'.5	10'.0	8'.7	
09	315° 10'.3	25'.7	340° 02'.1	13'.6	01'.3	8'.7	
10	330° 10'.5	24'.8	354° 34'.7	13'.6	10° 52'.6 N	8'.8	
11	345° 10'.7	23'.9	9° 07'.3	13'.6	43'.8	8'.8	55'.0
12	0° 10'.9	7° 23'.0 N	23° 39'.9	13'.6	10° 35'.0 N	8'.9	55'.0
13	15° 11'.1	22'.1	38° 12'.5	13'.6	26'.1	9'.0	
14	30° 11'.3	21'.1	52° 45'.1	13'.6	17'.1	9'.0	
15	45° 11'.5	20'.2	67° 17'.7	13'.7	08'.1	9'.0	
16	60° 11'.7	19'.3	81° 50'.4	13'.6	9° 59'.1 N	9'.1	
17	75° 11'.9	18'.4	96° 23'.0	13'.6	50'.0	9'.1	55'.1
18	90° 12'.1	17'.4	110° 55'.6	13'.7	40'.9	9'.2	
19	105° 12'.3	16'.5	125° 28'.3	13'.6	31'.7	9'.3	
20	120° 12'.5	15'.6	140° 00'.9	13'.7	22'.4	9'.3	
21	135° 12'.7	14'.7	154° 33'.6	13'.7	13'.1	9'.3	
22	150° 12'.9	13'.8	169° 06'.3	13'.6	03'.8	9'.4	
23	165° 13'.1	12'.8	183° 38'.9	13'.7	8° 54'.4 N	9'.4	55'.2
	SD 15'.9	d 0'.9	SD 14'.8		14'.9	15'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3
N 72°	-	02:39	04:07	23:31	-	01:22
N 70°	00:19	03:06	04:20	-	00:07	01:44
68°	01:41	03:25	04:30	-	00:32	02:01
66°	02:16	03:41	04:39	-	00:52	02:15
64°	02:41	03:53	04:46	-	01:08	02:26
62°	03:00	04:04	04:52	00:10	01:20	02:35
60°	03:15	04:13	04:57	00:23	01:31	02:43
N 58°	03:27	04:20	05:02	00:35	01:41	02:51
56°	03:38	04:27	05:06	00:45	01:49	02:57
54°	03:47	04:33	05:10	00:54	01:57	03:02
52°	03:55	04:38	05:13	01:02	02:03	03:07
50°	04:02	04:43	05:17	01:09	02:09	03:12
45°	04:17	04:53	05:23	01:24	02:22	03:22
N 40°	04:28	05:01	05:29	01:37	02:32	03:30
35°	04:37	05:08	05:33	01:47	02:41	03:37
30°	04:45	05:13	05:38	01:57	02:49	03:43
20°	04:56	05:22	05:45	02:13	03:03	03:54
N 10°	05:05	05:29	05:51	02:27	03:15	04:03
0°	05:11	05:35	05:56	02:40	03:26	04:11
S 10°	05:16	05:41	06:02	02:53	03:37	04:20
20°	05:20	05:45	06:08	03:06	03:49	04:29
30°	05:22	05:50	06:14	03:22	04:02	04:40
35°	05:23	05:52	06:18	03:32	04:10	04:46
40°	05:23	05:55	06:22	03:42	04:19	04:53
45°	05:23	05:57	06:27	03:54	04:29	05:00
S 50°	05:22	06:00	06:32	04:09	04:41	05:10
52°	05:22	06:01	06:35	04:16	04:47	05:14
54°	05:21	06:02	06:38	04:24	04:54	05:19
56°	05:20	06:03	06:41	04:33	05:01	05:25
58°	05:19	06:05	06:44	04:42	05:09	05:30
S 60°	05:18	06:06	06:48	04:53	05:18	05:37
S 62°	05:16	06:08	06:52	05:06	05:28	05:45

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 1	Moonset 2	Moonset 3
N 72°	19:49	21:15	-	19:09	18:53	18:41
N 70°	19:37	20:50	23:12	18:32	18:30	18:27
68°	19:27	20:31	22:11	18:06	18:12	18:15
66°	19:18	20:16	21:38	17:46	17:57	18:05
64°	19:11	20:04	21:15	17:29	17:45	17:57
62°	19:05	19:53	20:57	17:16	17:35	17:50
60°	19:00	19:45	20:42	17:04	17:26	17:44
N 58°	18:56	19:37	20:30	16:54	17:18	17:39
56°	18:52	19:31	20:19	16:46	17:11	17:34
54°	18:48	19:25	20:11	16:38	17:05	17:29
52°	18:45	19:20	20:03	16:31	17:00	17:25
50°	18:42	19:15	19:56	16:25	16:55	17:22
45°	18:35	19:05	19:42	16:11	16:44	17:14
N 40°	18:30	18:57	19:30	16:00	16:35	17:08
35°	18:25	18:51	19:21	15:50	16:27	17:02
30°	18:21	18:45	19:14	15:42	16:20	16:57
20°	18:14	18:37	19:03	15:27	16:08	16:48
N 10°	18:08	18:30	18:54	15:14	15:58	16:40
0°	18:03	18:24	18:48	15:02	15:48	16:33
S 10°	17:58	18:19	18:43	14:50	15:38	16:26
20°	17:52	18:14	18:40	14:37	15:27	16:18
30°	17:46	18:10	18:37	14:22	15:15	16:09
35°	17:42	18:07	18:37	14:13	15:08	16:04
40°	17:38	18:05	18:37	14:03	15:00	15:58
45°	17:33	18:03	18:37	13:52	14:50	15:51
S 50°	17:28	18:00	18:38	13:37	14:39	15:43
52°	17:25	17:59	18:38	13:31	14:34	15:39
54°	17:23	17:58	18:39	13:23	14:28	15:35
56°	17:20	17:57	18:40	13:15	14:21	15:30
58°	17:16	17:56	18:41	13:06	14:14	15:25
S 60°	17:12	17:54	18:43	12:55	14:05	15:19
S 62°	17:08	17:53	18:44	12:42	13:56	15:12

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
1	0 05	0 04	12:00	08:51	21:14	26d 15%
2	0 14	0 24	12:00	09:37	22:00	27d 9%
3	0 33	0 43	11:59	10:22	22:45	28d 4%

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2013 September 4, 5, 6 (Wed, Thur, Fri)

GMT	ARIES	VENUS -4.0		MARS +1.6		JUPITER -2.1		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
4 Wednesday 00	343° 16'.8	143° 27'.5	8° 41'.3 S	216° 16'.5	20° 09'.0 N	237° 32'.4	22° 31'.8 N	127° 29'.5	11° 51'.6 S
01	358° 19'.2	158° 27'.3	42'.5	231° 17'.3	08'.7	252° 34'.4	31'.8	142° 31'.7	51'.7
02	13° 21'.7	173° 27'.1	43'.7	246° 18'.1	08'.3	267° 36'.4	31'.7	157° 34'.0	51'.8
03	28° 24'.2	188° 26'.9	45'.0	261° 19'.0	08'.0	282° 38'.4	31'.7	172° 36'.3	51'.9
04	43° 26'.6	203° 26'.7	46'.2	276° 19'.8	07'.6	297° 40'.4	31'.6	187° 38'.5	51'.9
05	58° 29'.1	218° 26'.5	47'.4	291° 20'.6	07'.2	312° 42'.4	31'.6	202° 40'.8	52'.0
06	73° 31'.6	233° 26'.3	48'.7	306° 21'.4	06'.9	327° 44'.4	31'.6	217° 43'.0	52'.1
07	88° 34'.0	248° 26'.1	49'.9	321° 22'.2	06'.5	342° 46'.4	31'.5	232° 45'.3	52'.2
08	103° 36'.5	263° 25'.9	51'.2	336° 23'.0	06'.2	357° 48'.5	31'.5	247° 47'.6	52'.2
09	118° 38'.9	278° 25'.6	52'.4	351° 23'.9	05'.8	12° 50'.5	31'.4	262° 49'.8	52'.3
10	133° 41'.4	293° 25'.4	53'.6	6° 24'.7	05'.4	27° 52'.5	31'.4	277° 52'.1	52'.4
11	148° 43'.9	308° 25'.2	54'.9	21° 25'.5	05'.1	42° 54'.5	31'.4	292° 54'.4	52'.5
12	163° 46'.3	323° 25'.0	8° 56'.1 S	36° 26'.3	20° 04'.7 N	57° 56'.5	22° 31'.3 N	307° 56'.6	11° 52'.5 S
13	178° 48'.8	338° 24'.8	57'.3	51° 27'.1	04'.4	72° 58'.5	31'.3	322° 58'.9	52'.6
14	193° 51'.3	353° 24'.6	58'.6	66° 28'.0	04'.0	88° 00'.5	31'.2	338° 01'.2	52'.7
15	208° 53'.7	8° 24'.4	59'.8	81° 28'.8	03'.6	103° 02'.5	31'.2	353° 03'.4	52'.8
16	223° 56'.2	23° 24'.2	9° 01'.0 S	96° 29'.6	03'.3	118° 04'.6	31'.1	8° 05'.7	52'.8
17	238° 58'.7	38° 23'.9	02'.3	111° 30'.4	02'.9	133° 06'.6	31'.1	23° 07'.9	52'.9
18	254° 01'.1	53° 23'.7	03'.5	126° 31'.2	02'.6	148° 08'.6	31'.1	38° 10'.2	53'.0
19	269° 03'.6	68° 23'.5	04'.7	141° 32'.0	02'.2	163° 10'.6	31'.0	53° 12'.5	53'.1
20	284° 06'.1	83° 23'.3	06'.0	156° 32'.9	01'.8	178° 12'.6	31'.0	68° 14'.7	53'.1
21	299° 08'.5	98° 23'.1	07'.2	171° 33'.7	01'.5	193° 14'.6	30'.9	83° 17'.0	53'.2
22	314° 11'.0	113° 22'.9	08'.4	186° 34'.5	01'.1	208° 16'.6	30'.9	98° 19'.3	53'.3
23	329° 13'.4	128° 22'.7	09'.6	201° 35'.3	00'.7	223° 18'.7	30'.9	113° 21'.5	53'.4
5 Thursday 00	344° 15'.9	143° 22'.5	9° 10'.9 S	216° 36'.2	20° 00'.4 N	238° 20'.7	22° 30'.8 N	128° 23'.8	11° 53'.4 S
01	359° 18'.4	158° 22'.2	12'.1	231° 37'.0	00'.0	253° 22'.7	30'.8	143° 26'.0	53'.5
02	14° 20'.8	173° 22'.0	13'.3	246° 37'.8	19° 59'.7 N	268° 24'.7	30'.7	158° 28'.3	53'.6
03	29° 23'.3	188° 21'.8	14'.6	261° 38'.6	59'.3	283° 26'.7	30'.7	173° 30'.6	53'.7
04	44° 25'.8	203° 21'.6	15'.8	276° 39'.4	58'.9	298° 28'.7	30'.6	188° 32'.8	53'.8
05	59° 28'.2	218° 21'.4	17'.0	291° 40'.3	58'.6	313° 30'.8	30'.6	203° 35'.1	53'.8
06	74° 30'.7	233° 21'.2	18'.3	306° 41'.1	58'.2	328° 32'.8	30'.6	218° 37'.3	53'.9
07	89° 33'.2	248° 21'.0	19'.5	321° 41'.9	57'.8	343° 34'.8	30'.5	233° 39'.6	54'.0
08	104° 35'.6	263° 20'.7	20'.7	336° 42'.7	57'.5	358° 36'.8	30'.5	248° 41'.9	54'.1
09	119° 38'.1	278° 20'.5	21'.9	351° 43'.5	57'.1	13° 38'.8	30'.4	263° 44'.1	54'.1
10	134° 40'.5	293° 20'.3	23'.2	6° 44'.4	56'.7	28° 40'.8	30'.4	278° 46'.4	54'.2
11	149° 43'.0	308° 20'.1	24'.4	21° 45'.2	56'.4	43° 42'.9	30'.4	293° 48'.6	54'.3
12	164° 45'.5	323° 19'.9	9° 25'.6 S	36° 46'.0	19° 56'.0 N	58° 44'.9	22° 30'.3 N	308° 50'.9	11° 54'.4 S
13	179° 47'.9	338° 19'.7	26'.8	51° 46'.8	55'.6	73° 46'.9	30'.3	323° 53'.2	54'.4
14	194° 50'.4	353° 19'.4	28'.1	66° 47'.7	55'.3	88° 48'.9	30'.2	338° 55'.4	54'.5
15	209° 52'.9	8° 19'.2	29'.3	81° 48'.5	54'.9	103° 50'.9	30'.2	353° 57'.7	54'.6
16	224° 55'.3	23° 19'.0	30'.5	96° 49'.3	54'.5	118° 53'.0	30'.1	8° 59'.9	54'.7
17	239° 57'.8	38° 18'.8	31'.7	111° 50'.1	54'.2	133° 55'.0	30'.1	24° 02'.2	54'.7
18	255° 00'.3	53° 18'.6	33'.0	126° 51'.0	53'.8	148° 57'.0	30'.1	39° 04'.5	54'.8
19	270° 02'.7	68° 18'.4	34'.2	141° 51'.8	53'.4	163° 59'.0	30'.0	54° 06'.7	54'.9
20	285° 05'.2	83° 18'.1	35'.4	156° 52'.6	53'.1	179° 01'.0	30'.0	69° 09'.0	55'.0
21	300° 07'.7	98° 17'.9	36'.6	171° 53'.4	52'.7	194° 03'.1	29'.9	84° 11'.2	55'.1
22	315° 10'.1	113° 17'.7	37'.9	186° 54'.3	52'.3	209° 05'.1	29'.9	99° 13'.5	55'.1
23	330° 12'.6	128° 17'.5	39'.1	201° 55'.1	52'.0	224° 07'.1	29'.9	114° 15'.8	55'.2
6 Friday 00	345° 15'.0	143° 17'.3	9° 40'.3 S	216° 55'.9	19° 51'.6 N	239° 09'.1	22° 29'.8 N	129° 18'.0	11° 55'.3 S
01	0° 17'.5	158° 17'.1	41'.5	231° 56'.7	51'.2	254° 11'.1	29'.8	144° 20'.3	55'.4
02	15° 20'.0	173° 16'.8	42'.8	246° 57'.6	50'.9	269° 13'.2	29'.7	159° 22'.5	55'.4
03	30° 22'.4	188° 16'.6	44'.0	261° 58'.4	50'.5	284° 15'.2	29'.7	174° 24'.8	55'.5
04	45° 24'.9	203° 16'.4	45'.2	276° 59'.2	50'.1	299° 17'.2	29'.6	189° 27'.1	55'.6
05	60° 27'.4	218° 16'.2	46'.4	292° 00'.1	49'.8	314° 19'.2	29'.6	204° 29'.3	55'.7
06	75° 29'.8	233° 16'.0	47'.6	307° 00'.9	49'.4	329° 21'.2	29'.6	219° 31'.6	55'.7
07	90° 32'.3	248° 15'.7	48'.9	322° 01'.7	49'.0	344° 23'.3	29'.5	234° 33'.8	55'.8
08	105° 34'.8	263° 15'.5	50'.1	337° 02'.5	48'.7	359° 25'.3	29'.5	249° 36'.1	55'.9
09	120° 37'.2	278° 15'.3	51'.3	352° 03'.4	48'.3	14° 27'.3	29'.4	264° 38'.3	56'.0
10	135° 39'.7	293° 15'.1	52'.5	7° 04'.2	47'.9	29° 29'.3	29'.4	279° 40'.6	56'.1
11	150° 42'.1	308° 14'.9	53'.7	22° 05'.0	47'.5	44° 31'.4	29'.4	294° 42'.9	56'.1
12	165° 44'.6	323° 14'.6	9° 55'.0 S	37° 05'.8	19° 47'.2 N	59° 33'.4	22° 29'.3 N	309° 45'.1	11° 56'.2 S
13	180° 47'.1	338° 14'.4	56'.2	52° 06'.7	46'.8	74° 35'.4	29'.3	324° 47'.4	56'.3
14	195° 49'.5	353° 14'.2	57'.4	67° 07'.5	46'.4	89° 37'.4	29'.2	339° 49'.6	56'.4
15	210° 52'.0	8° 14'.0	58'.6	82° 08'.3	46'.1	104° 39'.4	29'.2	354° 51'.9	56'.4
16	225° 54'.5	23° 13'.8	59'.8	97° 09'.2	45'.7	119° 41'.5	29'.1	9° 54'.2	56'.5
17	240° 56'.9	38° 13'.5	10° 01'.0 S	112° 10'.0	45'.3	134° 43'.5	29'.1	24° 56'.4	56'.6
18	255° 59'.4	53° 13'.3	02'.3	127° 10'.8	44'.9	149° 45'.5	29'.1	39° 58'.7	56'.7
19	271° 01'.9	68° 13'.1	03'.5	142° 11'.7	44'.6	164° 47'.5	29'.0	55° 00'.9	56'.7
20	286° 04'.3	83° 12'.9	04'.7	157° 12'.5	44'.2	179° 49'.6	29'.0	70° 03'.2	56'.8
21	301° 06'.8	98° 12'.7	05'.9	172° 13'.3	43'.8	194° 51'.6	28'.9	85° 05'.4	56'.9
22	316° 09'.3	113° 12'.4	07'.1	187° 14'.1	43'.5	209° 53'.6	28'.9	100° 07'.7	57'.0
23	331° 11'.7	128° 12'.2	08'.3	202° 15'.0	43'.1	224° 55'.6	28'.9	115° 09'.9	57'.1
	M.P. 00:59	v -0'.2	d 1'.2	v 0'.8	d 0'.4	v 2'.0	d 0'.0	v 2'.3	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.0	40° 14'.8 S
Achernar	335° 26'.3	57° 09'.8 S
Acrux	173° 09'.7	63° 10'.6 S
Adhara	255° 12'.6	28° 59'.4 S
Aldebaran	290° 49'.2	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.3 N
Alkaid	152° 59'.1	49° 14'.9 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.3	1° 11'.6 S
Alphard	217° 56'.2	8° 43'.1 S
Alphecca	126° 11'.0	26° 40'.4 N
Alpheratz	357° 43'.0	29° 10'.1 N
Altair	62° 07'.8	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.7 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.7	69° 03'.2 S
Avior	234° 18'.4	59° 33'.1 S
Bellatrix	278° 31'.9	6° 21'.7 N
Betelgeuse	271° 01'.2	7° 24'.5 N
Canopus	263° 56'.3	52° 42'.0 S
Capella	280° 34'.2	46° 00'.4 N
Deneb	49° 31'.0	45° 20'.1 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.6 N
Elnath	278° 12'.5	28° 36'.9 N
Eltanin	90° 45'.9	51° 29'.7 N
Enif	33° 46'.6	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.7 S
Gacrux	172° 01'.2	57° 11'.5 S
Gienah	175° 52'.4	17° 37'.1 S
Hadar	148° 48'.0	60° 26'.5 S
Hamal	328° 00'.3	23° 31'.6 N
Kaus Aust.	83° 43'.4	34° 22'.6 S
Kochab	137° 20'.7	74° 06'.3 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.7	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.2 S
Miaplacidus	221° 40'.4	69° 46'.4 S
Mirfak	308° 39'.9	49° 54'.4 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.5	56° 41'.4 S
Polaris	317° 28'.4	89° 19'.1 N
Pollux	243° 27'.8	27° 59'.4 N
Procyon	244° 59'.8	5° 11'.3 N
Rasalhague	96° 06'.2	12° 33'.4 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 11'.9	8° 11'.1 S
Rigil Kent	139° 51'.7	60° 53'.6 S
Sabik	102° 12'.3	15° 44'.3 S
Schedar	349° 39'.8	56° 36'.7 N
Shaula	96° 21'.6	37° 06'.7 S
Sirius	258° 33'.7	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.2 S
Vega	80° 38'.7	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	159° 06'.5	14:27
Mars	232° 20'.2	09:33
Jupiter	254° 04'.8	08:06
Saturn	144° 07'.9	15:24

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
4 Wednesday 00	180° 13'.3	7° 11'.9 N	198° 11'.6	13'.7	8° 45'.0 N	9'.5	55'.2
01	195° 13'.5	11'.0	212° 44'.3	13'.7	35'.5	9'.5	
02	210° 13'.8	10'.1	227° 17'.0	13'.6	26'.0	9'.6	
03	225° 14'.0	09'.2	241° 49'.6	13'.7	16'.4	9'.6	
04	240° 14'.2	08'.2	256° 22'.3	13'.7	06'.8	9'.6	55'.3
05	255° 14'.4	07'.3	270° 55'.0	13'.7	7° 57'.2 N	9'.7	
06	270° 14'.6	06'.4	285° 27'.7	13'.7	47'.5	9'.7	
07	285° 14'.8	05'.5	300° 00'.4	13'.7	37'.8	9'.8	
08	300° 15'.0	04'.5	314° 33'.1	13'.7	28'.0	9'.8	
09	315° 15'.2	03'.6	329° 05'.8	13'.7	18'.2	9'.9	55'.4
10	330° 15'.4	02'.7	343° 38'.5	13'.6	08'.3	9'.9	
11	345° 15'.6	01'.8	358° 11'.1	13'.7	6° 58'.4 N	9'.9	
12	0° 15'.8	7° 00'.8 N	12° 43'.8	13'.7	6° 48'.5 N	10'.0	55'.4
13	15° 16'.0	6° 59'.9 N	27° 16'.5	13'.7	38'.5	10'.0	
14	30° 16'.2	59'.0	41° 49'.2	13'.7	28'.5	10'.0	55'.5
15	45° 16'.4	58'.1	56° 21'.9	13'.7	18'.5	10'.1	
16	60° 16'.6	57'.1	70° 54'.6	13'.6	08'.4	10'.1	
17	75° 16'.8	56'.2	85° 27'.2	13'.7	5° 58'.3 N	10'.1	
18	90° 17'.1	55'.3	99° 59'.9	13'.7	48'.2	10'.2	
19	105° 17'.3	54'.4	114° 32'.6	13'.6	38'.0	10'.2	55'.6
20	120° 17'.5	53'.4	129° 05'.2	13'.7	27'.8	10'.2	
21	135° 17'.7	52'.5	143° 37'.9	13'.6	17'.6	10'.3	
22	150° 17'.9	51'.6	158° 10'.5	13'.7	07'.3	10'.3	
23	165° 18'.1	50'.7	172° 43'.2	13'.6	4° 57'.0 N	10'.3	
5 Thursday 00	180° 18'.3	6° 49'.7 N	187° 15'.8	13'.7	4° 46'.7 N	10'.4	55'.7
01	195° 18'.5	48'.8	201° 48'.5	13'.6	36'.3	10'.4	
02	210° 18'.7	47'.9	216° 21'.1	13'.6	25'.9	10'.4	
03	225° 18'.9	47'.0	230° 53'.7	13'.6	15'.5	10'.4	
04	240° 19'.1	46'.0	245° 26'.3	13'.6	05'.1	10'.5	
05	255° 19'.3	45'.1	259° 58'.9	13'.6	3° 54'.6 N	10'.5	55'.8
06	270° 19'.5	44'.2	274° 31'.5	13'.5	44'.1	10'.5	
07	285° 19'.8	43'.2	289° 04'.0	13'.6	33'.6	10'.6	
08	300° 20'.0	42'.3	303° 36'.6	13'.6	23'.0	10'.5	
09	315° 20'.2	41'.4	318° 09'.2	13'.5	12'.5	10'.6	
10	330° 20'.4	40'.5	332° 41'.7	13'.5	01'.9	10'.6	55'.9
11	345° 20'.6	39'.5	347° 14'.2	13'.5	2° 51'.3 N	10'.6	
12	0° 20'.8	6° 38'.6 N	1° 46'.7	13'.5	2° 40'.7 N	10'.7	55'.9
13	15° 21'.0	37'.7	16° 19'.2	13'.5	30'.0	10'.6	
14	30° 21'.2	36'.7	30° 51'.7	13'.5	19'.4	10'.7	
15	45° 21'.4	35'.8	45° 24'.2	13'.4	08'.7	10'.7	56'.0
16	60° 21'.6	34'.9	59° 56'.6	13'.5	1° 58'.0 N	10'.8	
17	75° 21'.8	34'.0	74° 29'.1	13'.4	47'.2	10'.7	
18	90° 22'.1	33'.0	89° 01'.5	13'.4	36'.5	10'.7	
19	105° 22'.3	32'.1	103° 33'.9	13'.4	25'.8	10'.8	
20	120° 22'.5	31'.2	118° 06'.3	13'.3	15'.0	10'.8	56'.1
21	135° 22'.7	30'.2	132° 38'.6	13'.4	04'.2	10'.8	
22	150° 22'.9	29'.3	147° 11'.0	13'.3	0° 53'.4 N	10'.8	
23	165° 23'.1	28'.4	161° 43'.3	13'.3	42'.6	10'.8	
6 Friday 00	180° 23'.3	6° 27'.4 N	176° 15'.6	13'.3	0° 31'.8 N	10'.8	56'.2
01	195° 23'.5	26'.5	190° 47'.9	13'.3	21'.0	10'.8	
02	210° 23'.7	25'.6	205° 20'.2	13'.2	10'.2	10'.9	
03	225° 23'.9	24'.7	219° 52'.4	13'.3	0° 00'.7 S	10'.8	
04	240° 24'.2	23'.7	234° 24'.7	13'.2	11'.5	10'.9	
05	255° 24'.4	22'.8	248° 56'.9	13'.1	22'.4	10'.8	56'.3
06	270° 24'.6	21'.9	263° 29'.0	13'.2	33'.2	10'.9	
07	285° 24'.8	20'.9	278° 01'.2	13'.1	44'.1	10'.9	
08	300° 25'.0	20'.0	292° 33'.3	13'.1	55'.0	10'.8	
09	315° 25'.2	19'.1	307° 05'.4	13'.1	1° 05'.8 S	10'.9	
10	330° 25'.4	18'.1	321° 37'.5	13'.0	16'.7	10'.9	56'.4
11	345° 25'.6	17'.2	336° 09'.5	13'.1	27'.6	10'.9	
12	0° 25'.8	6° 16'.3 N	350° 41'.6	13'.0	1° 38'.5 S	10'.8	56'.4
13	15° 26'.1	15'.3	5° 13'.6	12'.9	49'.3	10'.9	
14	30° 26'.3	14'.4	19° 45'.5	13'.0	2° 00'.2 S	10'.9	56'.5
15	45° 26'.5	13'.5	34° 17'.5	12'.9	11'.1	10'.9	
16	60° 26'.7	12'.5	48° 49'.4	12'.9	22'.0	10'.8	
17	75° 26'.9	11'.6	63° 21'.3	12'.8	32'.8	10'.9	
18	90° 27'.1	10'.7	77° 53'.1	12'.8	43'.7	10'.8	
19	105° 27'.3	09'.7	92° 24'.9	12'.8	54'.5	10'.9	56'.6
20	120° 27'.5	08'.8	106° 56'.7	12'.8	3° 05'.4 S	10'.8	
21	135° 27'.7	07'.9	121° 28'.5	12'.7	16'.2	10'.9	
22	150° 28'.0	06'.9	136° 00'.2	12'.7	27'.1	10'.8	
23	165° 28'.2	06'.0	150° 31'.9	12'.6	37'.9	10'.8	
	SD 15'.9	d 0'.9	SD	15'.1	15'.2	15'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6
N 72°	-	02:59	04:21	03:08	04:52	06:37
N 70°	01:18	03:21	04:32	03:21	04:58	06:36
68°	02:04	03:38	04:41	03:31	05:02	06:35
66°	02:33	03:52	04:48	03:40	05:06	06:34
64°	02:54	04:03	04:55	03:47	05:09	06:34
62°	03:11	04:12	05:00	03:53	05:12	06:33
60°	03:24	04:20	05:05	03:58	05:15	06:33
N 58°	03:35	04:27	05:09	04:03	05:17	06:32
56°	03:45	04:33	05:12	04:07	05:18	06:32
54°	03:54	04:39	05:15	04:10	05:20	06:31
52°	04:01	04:43	05:18	04:14	05:22	06:31
50°	04:07	04:48	05:21	04:17	05:23	06:31
45°	04:21	04:57	05:27	04:23	05:26	06:30
N 40°	04:31	05:04	05:32	04:29	05:29	06:30
35°	04:40	05:10	05:36	04:33	05:31	06:29
30°	04:46	05:15	05:39	04:37	05:33	06:29
20°	04:57	05:23	05:45	04:45	05:36	06:28
N 10°	05:05	05:29	05:51	04:51	05:39	06:28
0°	05:10	05:35	05:55	04:57	05:42	06:27
S 10°	05:14	05:39	06:00	05:02	05:45	06:27
20°	05:17	05:43	06:05	05:09	05:47	06:26
30°	05:19	05:46	06:10	05:16	05:51	06:26
35°	05:19	05:48	06:14	05:20	05:53	06:26
40°	05:19	05:50	06:17	05:24	05:55	06:25
45°	05:18	05:52	06:21	05:30	05:57	06:25
S 50°	05:16	05:53	06:26	05:36	06:00	06:25
52°	05:15	05:54	06:28	05:39	06:02	06:24
54°	05:14	05:55	06:30	05:42	06:03	06:24
56°	05:13	05:56	06:33	05:46	06:05	06:24
58°	05:11	05:57	06:36	05:49	06:07	06:24
S 60°	05:09	05:57	06:39	05:54	06:09	06:23
S 62°	05:07	05:58	06:43	05:59	06:11	06:23

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 4	Moonset 5	Moonset 6
N 72°	19:33	20:53	-	18:31	18:22	18:13
N 70°	19:22	20:32	22:28	18:24	18:20	18:17
68°	19:14	20:16	21:47	18:17	18:19	18:20
66°	19:07	20:03	21:20	18:12	18:17	18:23
64°	19:01	19:52	21:00	18:07	18:16	18:25
62°	18:56	19:43	20:44	18:03	18:15	18:27
60°	18:51	19:35	20:31	18:00	18:14	18:29
N 58°	18:47	19:28	20:20	17:57	18:14	18:30
56°	18:44	19:22	20:10	17:54	18:13	18:32
54°	18:41	19:17	20:02	17:51	18:12	18:33
52°	18:38	19:13	19:55	17:49	18:12	18:34
50°	18:35	19:08	19:49	17:47	18:11	18:35
45°	18:30	19:00	19:35	17:42	18:10	18:38
N 40°	18:25	18:53	19:25	17:39	18:09	18:40
35°	18:21	18:47	19:17	17:35	18:08	18:41
30°	18:18	18:42	19:10	17:32	18:07	18:43
20°	18:12	18:34	19:00	17:27	18:06	18:45
N 10°	18:07	18:28	18:52	17:23	18:05	18:47
0°	18:02	18:23	18:47	17:18	18:04	18:50
S 10°	17:57	18:18	18:43	17:14	18:02	18:52
20°	17:53	18:15	18:40	17:09	18:01	18:54
30°	17:47	18:11	18:39	17:04	18:00	18:56
35°	17:44	18:10	18:39	17:01	17:59	18:58
40°	17:41	18:08	18:39	16:57	17:58	18:59
45°	17:37	18:06	18:40	16:53	17:57	19:01
S 50°	17:32	18:05	18:42	16:48	17:55	19:04
52°	17:30	18:04	18:43	16:46	17:55	19:05
54°	17:28	18:03	18:44	16:44	17:54	19:06
56°	17:25	18:03	18:46	16:41	17:53	19:07
58°	17:23	18:02	18:47	16:38	17:52	19:09
S 60°	17:19	18:01	18:49	16:34	17:51	19:10
S 62°	17:16	18:00	18:52	16:30	17:50	19:12

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
4	0 53	1 03	11:59	11:07	23:30	29d 1%
5	1 13	1 23	11:59	11:53	24:15	0d 0%
6	1 33	1 43	11:58	12:38	00:15	1d 1%

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2013 September 7, 8, 9 (Sat, Sun, Mon)

GMT	ARIES	VENUS -4.1		MARS +1.6		JUPITER -2.1		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
7 Saturday 00	346° 14'.2	143° 12'.0	10° 09'.6 S	217° 15'.8	19° 42'.7 N	239° 57'.7	22° 28'.8 N	130° 12'.2	11° 57'.1 S
01	1° 16'.6	158° 11'.8	10'.8	232° 16'.6	42'.3	254° 59'.7	28'.8	145° 14'.5	57'.2
02	16° 19'.1	173° 11'.5	12'.0	247° 17'.5	42'.0	270° 01'.7	28'.7	160° 16'.7	57'.3
03	31° 21'.6	188° 11'.3	13'.2	262° 18'.3	41'.6	285° 03'.7	28'.7	175° 19'.0	57'.4
04	46° 24'.0	203° 11'.1	14'.4	277° 19'.1	41'.2	300° 05'.8	28'.6	190° 21'.2	57'.4
05	61° 26'.5	218° 10'.9	15'.6	292° 20'.0	40'.8	315° 07'.8	28'.6	205° 23'.5	57'.5
06	76° 29'.0	233° 10'.7	16'.8	307° 20'.8	40'.5	330° 09'.8	28'.6	220° 25'.7	57'.6
07	91° 31'.4	248° 10'.4	18'.0	322° 21'.6	40'.1	345° 11'.9	28'.5	235° 28'.0	57'.7
08	106° 33'.9	263° 10'.2	19'.3	337° 22'.5	39'.7	0° 13'.9	28'.5	250° 30'.3	57'.8
09	121° 36'.4	278° 10'.0	20'.5	352° 23'.3	39'.3	15° 15'.9	28'.4	265° 32'.5	57'.8
10	136° 38'.8	293° 09'.8	21'.7	7° 24'.1	39'.0	30° 17'.9	28'.4	280° 34'.8	57'.9
11	151° 41'.3	308° 09'.5	22'.9	22° 25'.0	38'.6	45° 20'.0	28'.4	295° 37'.0	58'.0
12	166° 43'.7	323° 09'.3	10° 24'.1 S	37° 25'.8	19° 38'.2 N	60° 22'.0	22° 28'.3 N	310° 39'.3	11° 58'.1 S
13	181° 46'.2	338° 09'.1	25'.3	52° 26'.6	37'.8	75° 24'.0	28'.3	325° 41'.5	58'.1
14	196° 48'.7	353° 08'.9	26'.5	67° 27'.5	37'.5	90° 26'.0	28'.2	340° 43'.8	58'.2
15	211° 51'.1	8° 08'.6	27'.7	82° 28'.3	37'.1	105° 28'.1	28'.2	355° 46'.0	58'.3
16	226° 53'.6	23° 08'.4	28'.9	97° 29'.1	36'.7	120° 30'.1	28'.1	10° 48'.3	58'.4
17	241° 56'.1	38° 08'.2	30'.1	112° 30'.0	36'.3	135° 32'.1	28'.1	25° 50'.5	58'.5
18	256° 58'.5	53° 08'.0	31'.4	127° 30'.8	36'.0	150° 34'.2	28'.1	40° 52'.8	58'.5
19	272° 01'.0	68° 07'.7	32'.6	142° 31'.6	35'.6	165° 36'.2	28'.0	55° 55'.1	58'.6
20	287° 03'.5	83° 07'.5	33'.8	157° 32'.5	35'.2	180° 38'.2	28'.0	70° 57'.3	58'.7
21	302° 05'.9	98° 07'.3	35'.0	172° 33'.3	34'.8	195° 40'.3	27'.9	85° 59'.6	58'.8
22	317° 08'.4	113° 07'.1	36'.2	187° 34'.1	34'.4	210° 42'.3	27'.9	101° 01'.8	58'.8
23	332° 10'.9	128° 06'.8	37'.4	202° 35'.0	34'.1	225° 44'.3	27'.9	116° 04'.1	58'.9
8 Sunday 00	347° 13'.3	143° 06'.6	10° 38'.6 S	217° 35'.8	19° 33'.7 N	240° 46'.3	22° 27'.8 N	131° 06'.3	11° 59'.0 S
01	2° 15'.8	158° 06'.4	39'.8	232° 36'.7	33'.3	255° 48'.4	27'.8	146° 08'.6	59'.1
02	17° 18'.2	173° 06'.2	41'.0	247° 37'.5	32'.9	270° 50'.4	27'.7	161° 10'.8	59'.2
03	32° 20'.7	188° 05'.9	42'.2	262° 38'.3	32'.5	285° 52'.4	27'.7	176° 13'.1	59'.2
04	47° 23'.2	203° 05'.7	43'.4	277° 39'.2	32'.2	300° 54'.5	27'.6	191° 15'.3	59'.3
05	62° 25'.6	218° 05'.5	44'.6	292° 40'.0	31'.8	315° 56'.5	27'.6	206° 17'.6	59'.4
06	77° 28'.1	233° 05'.2	45'.8	307° 40'.8	31'.4	330° 58'.5	27'.6	221° 19'.8	59'.5
07	92° 30'.6	248° 05'.0	47'.0	322° 41'.7	31'.0	346° 00'.6	27'.5	236° 22'.1	59'.6
08	107° 33'.0	263° 04'.8	48'.2	337° 42'.5	30'.7	1° 02'.6	27'.5	251° 24'.3	59'.6
09	122° 35'.5	278° 04'.6	49'.4	352° 43'.4	30'.3	16° 04'.6	27'.4	266° 26'.6	59'.7
10	137° 38'.0	293° 04'.3	50'.6	7° 44'.2	29'.9	31° 06'.7	27'.4	281° 28'.9	59'.8
11	152° 40'.4	308° 04'.1	51'.8	22° 45'.0	29'.5	46° 08'.7	27'.4	296° 31'.1	59'.9
12	167° 42'.9	323° 03'.9	10° 53'.0 S	37° 45'.9	19° 29'.1 N	61° 10'.7	22° 27'.3 N	311° 33'.4	11° 59'.9 S
13	182° 45'.4	338° 03'.6	54'.2	52° 46'.7	28'.7	76° 12'.8	27'.3	326° 35'.6	12° 00'.0 S
14	197° 47'.8	353° 03'.4	55'.4	67° 47'.6	28'.4	91° 14'.8	27'.2	341° 37'.9	00'.1
15	212° 50'.3	8° 03'.2	56'.6	82° 48'.4	28'.0	106° 16'.8	27'.2	356° 40'.1	00'.2
16	227° 52'.7	23° 02'.9	57'.8	97° 49'.2	27'.6	121° 18'.9	27'.1	11° 42'.4	00'.3
17	242° 55'.2	38° 02'.7	59'.0	112° 50'.1	27'.2	136° 20'.9	27'.1	26° 44'.6	00'.3
18	257° 57'.7	53° 02'.5	11° 00'.2 S	127° 50'.9	26'.8	151° 22'.9	27'.1	41° 46'.9	00'.4
19	273° 00'.1	68° 02'.3	01'.4	142° 51'.8	26'.5	166° 25'.0	27'.0	56° 49'.1	00'.5
20	288° 02'.6	83° 02'.0	02'.6	157° 52'.6	26'.1	181° 27'.0	27'.0	71° 51'.4	00'.6
21	303° 05'.1	98° 01'.8	03'.8	172° 53'.4	25'.7	196° 29'.0	26'.9	86° 53'.6	00'.7
22	318° 07'.5	113° 01'.6	05'.0	187° 54'.3	25'.3	211° 31'.1	26'.9	101° 55'.9	00'.7
23	333° 10'.0	128° 01'.3	06'.2	202° 55'.1	24'.9	226° 33'.1	26'.9	116° 58'.1	00'.8
9 Monday 00	348° 12'.5	143° 01'.1	11° 07'.4 S	217° 56'.0	19° 24'.5 N	241° 35'.1	22° 26'.8 N	132° 00'.4	12° 00'.9 S
01	3° 14'.9	158° 00'.9	08'.6	232° 56'.8	24'.2	256° 37'.2	26'.8	147° 02'.6	01'.0
02	18° 17'.4	173° 00'.6	09'.8	247° 57'.6	23'.8	271° 39'.2	26'.7	162° 04'.9	01'.0
03	33° 19'.8	188° 00'.4	11'.0	262° 58'.5	23'.4	286° 41'.2	26'.7	177° 07'.1	01'.1
04	48° 22'.3	203° 00'.2	12'.2	277° 59'.3	23'.0	301° 43'.3	26'.6	192° 09'.4	01'.2
05	63° 24'.8	217° 59'.9	13'.4	293° 00'.2	22'.6	316° 45'.3	26'.6	207° 11'.6	01'.3
06	78° 27'.2	232° 59'.7	14'.6	308° 01'.0	22'.2	331° 47'.4	26'.6	222° 13'.9	01'.4
07	93° 29'.7	247° 59'.5	15'.8	323° 01'.9	21'.9	346° 49'.4	26'.5	237° 16'.1	01'.4
08	108° 32'.2	262° 59'.2	17'.0	338° 02'.7	21'.5	1° 51'.4	26'.5	252° 18'.4	01'.5
09	123° 34'.6	277° 59'.0	18'.2	353° 03'.5	21'.1	16° 53'.5	26'.4	267° 20'.6	01'.6
10	138° 37'.1	292° 58'.8	19'.4	8° 04'.4	20'.7	31° 55'.5	26'.4	282° 22'.9	01'.7
11	153° 39'.6	307° 58'.5	20'.6	23° 05'.2	20'.3	46° 57'.5	26'.4	297° 25'.1	01'.8
12	168° 42'.0	322° 58'.3	11° 21'.8 S	38° 06'.1	19° 19'.9 N	61° 59'.6	22° 26'.3 N	312° 27'.4	12° 01'.8 S
13	183° 44'.5	337° 58'.1	23'.0	53° 06'.9	19'.5	77° 01'.6	26'.3	327° 29'.6	01'.9
14	198° 47'.0	352° 57'.8	24'.1	68° 07'.8	19'.2	92° 03'.7	26'.2	342° 31'.9	02'.0
15	213° 49'.4	7° 57'.6	25'.3	83° 08'.6	18'.8	107° 05'.7	26'.2	357° 34'.1	02'.1
16	228° 51'.9	22° 57'.4	26'.5	98° 09'.5	18'.4	122° 07'.7	26'.1	12° 36'.4	02'.2
17	243° 54'.3	37° 57'.1	27'.7	113° 10'.3	18'.0	137° 09'.8	26'.1	27° 38'.6	02'.2
18	258° 56'.8	52° 56'.9	28'.9	128° 11'.1	17'.6	152° 11'.8	26'.1	42° 40'.9	02'.3
19	273° 59'.3	67° 56'.7	30'.1	143° 12'.0	17'.2	167° 13'.9	26'.0	57° 43'.1	02'.4
20	289° 01'.7	82° 56'.4	31'.3	158° 12'.8	16'.8	182° 15'.9	26'.0	72° 45'.4	02'.5
21	304° 04'.2	97° 56'.2	32'.5	173° 13'.7	16'.4	197° 17'.9	25'.9	87° 47'.6	02'.6
22	319° 06'.7	112° 56'.0	33'.7	188° 14'.5	16'.1	212° 20'.0	25'.9	102° 49'.9	02'.6
23	334° 09'.1	127° 55'.7	34'.9	203° 15'.4	15'.7	227° 22'.0	25'.9	117° 52'.1	02'.7
	M.P. 00:47	v -0'.2	d 1'.2	v 0'.8	d 0'.4	v 2'.0	d 0'.0	v 2'.3	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.0	40° 14'.8 S
Achernar	335° 26'.2	57° 09'.8 S
Acrux	173° 09'.7	63° 10'.6 S
Adhara	255° 12'.6	28° 59'.4 S
Aldebaran	290° 49'.1	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.3 N
Alkaid	152° 59'.2	49° 14'.9 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.2	1° 11'.6 S
Alphard	217° 56'.2	8° 43'.1 S
Alphecca	126° 11'.0	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.1 N
Altair	62° 07'.9	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.7 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.7	69° 03'.2 S
Avior	234° 18'.4	59° 33'.1 S
Bellatrix	278° 31'.9	6° 21'.7 N
Betelgeuse	271° 01'.2	7° 24'.5 N
Canopus	263° 56'.2	52° 42'.0 S
Capella	280° 34'.2	46° 00'.4 N
Deneb	49° 31'.0	45° 20'.1 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.6 N
Elnath	278° 12'.4	28° 36'.9 N
Eltanin	90° 45'.9	51° 29'.7 N
Enif	33° 46'.6	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.5 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.0	60° 26'.4 S
Hamal	328° 00'.3	23° 31'.6 N
Kaus Aust.	83° 43'.4	34° 22'.6 S
Kochab	137° 20'.7	74° 06'.3 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.7	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.2 S
Miaplacidus	221° 40'.4	69° 46'.4 S
Mirfak	308° 39'.9	49° 54'.4 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.4 S
Polaris	317° 27'.2	89° 19'.1 N
Pollux	243° 27'.8	27° 59'.4 N
Procyon	244° 59'.8	5° 11'.3 N
Rasalhague	96° 06'.2	12° 33'.4 N
Regulus	207° 43'.7	11° 54'.0 N
Rigel	281° 11'.9	8° 11'.1 S
Rigil Kent	139° 51'.8	60° 53'.6 S
Sabik	102° 12'.3	15° 44'.3 S
Schedar	349° 39'.7	56° 36'.8 N
Shaula	96° 21'.6	37° 06'.7 S
Sirius	258° 33'.7	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.2 S
Vega	80° 38'.7	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S
	SHA	Mer.Pass.
Venus	155° 53'.3	14:28
Mars	230° 22'.5	09:29
Jupiter	253° 33'.0	07:56
Saturn	143° 53'.0	15:13

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 28'.4	6° 05'.0 N	165° 03'.5	12'.6	3° 48'.7 S	10'.8	56'.7
195° 28'.6	04'.1	179° 35'.1	12'.6	59'.5	10'.8	
210° 28'.8	03'.2	194° 06'.7	12'.6	4° 10'.3 S	10'.8	
225° 29'.0	02'.2	208° 38'.3	12'.5	21'.1	10'.7	
240° 29'.2	01'.3	223° 09'.8	12'.5	31'.8	10'.8	
255° 29'.4	00'.4	237° 41'.3	12'.4	42'.6	10'.7	56'.8
270° 29'.7	5° 59'.4 N	252° 12'.7	12'.4	53'.3	10'.7	
285° 29'.9	58'.5	266° 44'.1	12'.4	5° 04'.0 S	10'.7	
300° 30'.1	57'.6	281° 15'.5	12'.3	14'.7	10'.7	
315° 30'.3	56'.6	295° 46'.8	12'.3	25'.4	10'.7	56'.9
330° 30'.5	55'.7	310° 18'.1	12'.2	36'.1	10'.6	
345° 30'.7	54'.7	324° 49'.3	12'.2	46'.7	10'.6	
0° 30'.9	5° 53'.8 N	339° 20'.5	12'.2	5° 57'.3 S	10'.6	56'.9
15° 31'.1	52'.9	353° 51'.7	12'.1	6° 07'.9 S	10'.6	
30° 31'.4	51'.9	8° 22'.8	12'.1	18'.5	10'.6	57'.0
45° 31'.6	51'.0	22° 53'.9	12'.0	29'.1	10'.5	
60° 31'.8	50'.1	37° 24'.9	12'.0	39'.6	10'.5	
75° 32'.0	49'.1	51° 55'.9	11'.9	50'.1	10'.5	
90° 32'.2	48'.2	66° 26'.8	11'.9	7° 00'.6 S	10'.4	
105° 32'.4	47'.2	80° 57'.7	11'.9	11'.0	10'.4	57'.1
120° 32'.6	46'.3	95° 28'.6	11'.8	21'.4	10'.4	
135° 32'.9	45'.4	109° 59'.4	11'.7	31'.8	10'.3	
150° 33'.1	44'.4	124° 30'.1	11'.8	42'.1	10'.4	
165° 33'.3	43'.5	139° 00'.9	11'.6	52'.5	10'.2	
180° 33'.5	5° 42'.5 N	153° 31'.5	11'.7	8° 02'.7 S	10'.3	57'.2
195° 33'.7	41'.6	168° 02'.2	11'.5	13'.0	10'.2	
210° 33'.9	40'.7	182° 32'.7	11'.6	23'.2	10'.2	
225° 34'.1	39'.7	197° 03'.3	11'.4	33'.4	10'.1	
240° 34'.4	38'.8	211° 33'.7	11'.5	43'.5	10'.1	
255° 34'.6	37'.8	226° 04'.2	11'.3	53'.6	10'.1	57'.3
270° 34'.8	36'.9	240° 34'.5	11'.4	9° 03'.7 S	10'.0	
285° 35'.0	36'.0	255° 04'.9	11'.2	13'.7	10'.0	
300° 35'.2	35'.0	269° 35'.1	11'.3	23'.7	9'.9	
315° 35'.4	34'.1	284° 05'.4	11'.1	33'.6	9'.9	
330° 35'.6	33'.1	298° 35'.5	11'.1	43'.5	9'.9	57'.4
345° 35'.9	32'.2	313° 05'.6	11'.1	53'.4	9'.8	
0° 36'.1	5° 31'.3 N	327° 35'.7	11'.0	10° 03'.2 S	9'.7	57'.4
15° 36'.3	30'.3	342° 05'.7	11'.0	12'.9	9'.7	
30° 36'.5	29'.4	356° 35'.7	10'.9	22'.6	9'.7	
45° 36'.7	28'.4	11° 05'.6	10'.8	32'.3	9'.6	57'.5
60° 36'.9	27'.5	25° 35'.4	10'.8	41'.9	9'.5	
75° 37'.2	26'.6	40° 05'.2	10'.8	51'.4	9'.6	
90° 37'.4	25'.6	54° 35'.0	10'.7	11° 01'.0 S	9'.4	
105° 37'.6	24'.7	69° 04'.7	10'.6	10'.4	9'.4	
120° 37'.8	23'.7	83° 34'.3	10'.6	19'.8	9'.4	57'.6
135° 38'.0	22'.8	98° 03'.9	10'.5	29'.2	9'.2	
150° 38'.2	21'.8	112° 33'.4	10'.5	38'.4	9'.3	
165° 38'.4	20'.9	127° 02'.9	10'.4	47'.7	9'.1	
180° 38'.7	5° 20'.0 N	141° 32'.3	10'.3	11° 56'.8 S	9'.2	57'.6
195° 38'.9	19'.0	156° 01'.6	10'.3	12° 06'.0 S	9'.0	57'.7
210° 39'.1	18'.1	170° 30'.9	10'.2	15'.0	9'.0	
225° 39'.3	17'.1	185° 00'.1	10'.2	24'.0	8'.9	
240° 39'.5	16'.2	199° 29'.3	10'.1	32'.9	8'.9	
255° 39'.7	15'.2	213° 58'.4	10'.1	41'.8	8'.8	
270° 40'.0	14'.3	228° 27'.5	10'.0	50'.6	8'.7	57'.8
285° 40'.2	13'.3	242° 56'.5	9'.9	59'.3	8'.7	
300° 40'.4	12'.4	257° 25'.4	9'.9	13° 08'.0 S	8'.6	
315° 40'.6	11'.5	271° 54'.3	9'.8	16'.6	8'.5	
330° 40'.8	10'.5	286° 23'.1	9'.8	25'.1	8'.5	
345° 41'.0	09'.6	300° 51'.9	9'.7	33'.6	8'.4	57'.9
0° 41'.3	5° 08'.6 N	315° 20'.6	9'.6	13° 42'.0 S	8'.3	57'.9
15° 41'.5	07'.7	329° 49'.2	9'.6	50'.3	8'.3	
30° 41'.7	06'.7	344° 17'.8	9'.6	58'.6	8'.1	
45° 41'.9	05'.8	358° 46'.4	9'.4	14° 06'.7 S	8'.1	
60° 42'.1	04'.8	13° 14'.8	9'.4	14'.8	8'.1	58'.0
75° 42'.3	03'.9	27° 43'.2	9'.4	22'.9	7'.9	
90° 42'.6	02'.9	42° 11'.6	9'.3	30'.8	7'.9	
105° 42'.8	02'.0	56° 39'.9	9'.2	38'.7	7'.8	
120° 43'.0	01'.1	71° 08'.1	9'.1	46'.5	7'.7	
135° 43'.2	00'.1	85° 36'.2	9'.2	54'.2	7'.6	
150° 43'.4	4° 59'.2 N	100° 04'.4	9'.0	15° 01'.8 S	7'.5	58'.1
165° 43'.7	58'.2	114° 32'.4	9'.0	09'.3	7'.5	
SD 15'.9	d 0'.9	SD	15'.5	15'.6	15'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9
N 72°	00:40	03:17	04:35	08:24	10:16	12:17
N 70°	01:49	03:36	04:45	08:16	10:00	11:48
68°	02:24	03:51	04:52	08:09	09:47	11:27
66°	02:48	04:03	04:58	08:04	09:36	11:10
64°	03:06	04:13	05:03	07:59	09:27	10:56
62°	03:21	04:21	05:08	07:56	09:20	10:45
60°	03:33	04:28	05:12	07:52	09:13	10:35
N 58°	03:44	04:34	05:15	07:49	09:08	10:27
56°	03:52	04:40	05:18	07:46	09:03	10:19
54°	04:00	04:44	05:21	07:44	08:58	10:13
52°	04:07	04:49	05:23	07:42	08:54	10:07
50°	04:13	04:52	05:25	07:40	08:50	10:02
45°	04:25	05:00	05:30	07:36	08:42	09:50
N 40°	04:34	05:07	05:34	07:32	08:36	09:41
35°	04:42	05:12	05:38	07:29	08:30	09:32
30°	04:48	05:17	05:41	07:26	08:25	09:25
20°	04:58	05:24	05:46	07:22	08:17	09:13
N 10°	05:05	05:29	05:50	07:18	08:09	09:03
0°	05:09	05:34	05:54	07:14	08:02	08:53
S 10°	05:13	05:37	05:58	07:10	07:55	08:43
20°	05:15	05:40	06:02	07:06	07:48	08:32
30°	05:15	05:43	06:07	07:02	07:40	08:21
35°	05:15	05:44	06:09	06:59	07:35	08:14
40°	05:14	05:45	06:12	06:57	07:30	08:06
45°	05:12	05:46	06:15	06:53	07:24	07:57
S 50°	05:10	05:47	06:19	06:49	07:16	07:46
52°	05:08	05:47	06:21	06:48	07:13	07:41
54°	05:07	05:48	06:23	06:46	07:09	07:36
56°	05:05	05:48	06:25	06:43	07:05	07:30
58°	05:03	05:48	06:27	06:41	07:00	07:23
S 60°	05:00	05:49	06:30	06:38	06:55	07:15
S 62°	04:58	05:49	06:33	06:35	06:50	07:07

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 7	Moonset 8	Moonset 9
N 72°	19:17	20:34	22:56	18:03	17:52	17:37
N 70°	19:08	20:15	21:59	18:14	18:10	18:08
68°	19:01	20:01	21:26	18:22	18:25	18:30
66°	18:55	19:50	21:03	18:29	18:37	18:48
64°	18:50	19:40	20:46	18:35	18:47	19:02
62°	18:46	19:32	20:31	18:40	18:55	19:14
60°	18:42	19:25	20:20	18:45	19:03	19:25
N 58°	18:39	19:19	20:10	18:48	19:09	19:34
56°	18:36	19:14	20:01	18:52	19:15	19:42
54°	18:33	19:09	19:54	18:55	19:20	19:49
52°	18:31	19:05	19:47	18:58	19:25	19:55
50°	18:29	19:02	19:41	19:01	19:29	20:01
45°	18:24	18:54	19:29	19:07	19:38	20:14
N 40°	18:20	18:48	19:20	19:11	19:46	20:24
35°	18:17	18:42	19:12	19:16	19:53	20:33
30°	18:14	18:38	19:06	19:19	19:58	20:41
20°	18:09	18:31	18:57	19:26	20:09	20:55
N 10°	18:05	18:26	18:50	19:31	20:18	21:06
0°	18:01	18:22	18:46	19:37	20:26	21:18
S 10°	17:57	18:18	18:43	19:42	20:34	21:29
20°	17:53	18:15	18:41	19:48	20:44	21:41
30°	17:49	18:13	18:40	19:54	20:54	21:54
35°	17:46	18:12	18:41	19:58	21:00	22:02
40°	17:44	18:11	18:42	20:02	21:07	22:12
45°	17:40	18:10	18:44	20:07	21:15	22:22
S 50°	17:37	18:09	18:46	20:13	21:24	22:35
52°	17:35	18:09	18:48	20:16	21:29	22:41
54°	17:33	18:09	18:49	20:19	21:33	22:48
56°	17:31	18:08	18:51	20:22	21:39	22:55
58°	17:29	18:08	18:54	20:26	21:45	23:04
S 60°	17:26	18:08	18:56	20:30	21:52	23:13
S 62°	17:24	18:08	18:59	20:35	22:00	23:24

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
7	1 53	2 03	11:58	13:25	01:02	2d 4%
8	2 14	2 24	11:58	14:14	01:49	3d 10%
9	2 34	2 45	11:57	15:05	02:39	4d 17%

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2013 September 10, 11, 12 (Tue, Wed, Thur)

GMT	ARIES	VENUS -4.1		MARS +1.6		JUPITER -2.1		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
10 Tuesday 00	349° 11'.6	142° 55'.5	11° 36'.0 S	218° 16'.2	19° 15'.3 N	242° 24'.1	22° 25'.8 N	132° 54'.4	12° 02'.8 S
01	4° 14'.1	157° 55'.2	37'.2	233° 17'.1	14'.9	257° 26'.1	25'.8	147° 56'.6	02'.9
02	19° 16'.5	172° 55'.0	38'.4	248° 17'.9	14'.5	272° 28'.1	25'.7	162° 58'.9	02'.9
03	34° 19'.0	187° 54'.8	39'.6	263° 18'.8	14'.1	287° 30'.2	25'.7	178° 01'.1	03'.0
04	49° 21'.4	202° 54'.5	40'.8	278° 19'.6	13'.7	302° 32'.2	25'.6	193° 03'.4	03'.1
05	64° 23'.9	217° 54'.3	42'.0	293° 20'.5	13'.3	317° 34'.3	25'.6	208° 05'.6	03'.2
06	79° 26'.4	232° 54'.1	43'.2	308° 21'.3	13'.0	332° 36'.3	25'.6	223° 07'.9	03'.3
07	94° 28'.8	247° 53'.8	44'.3	323° 22'.2	12'.6	347° 38'.3	25'.5	238° 10'.1	03'.3
08	109° 31'.3	262° 53'.6	45'.5	338° 23'.0	12'.2	2° 40'.4	25'.5	253° 12'.4	03'.4
09	124° 33'.8	277° 53'.3	46'.7	353° 23'.9	11'.8	17° 42'.4	25'.4	268° 14'.6	03'.5
10	139° 36'.2	292° 53'.1	47'.9	8° 24'.7	11'.4	32° 44'.5	25'.4	283° 16'.8	03'.6
11	154° 38'.7	307° 52'.9	49'.1	23° 25'.5	11'.0	47° 46'.5	25'.4	298° 19'.1	03'.7
12	169° 41'.2	322° 52'.6	11° 50'.3 S	38° 26'.4	19° 10'.6 N	62° 48'.6	22° 25'.3 N	313° 21'.3	12° 03'.7 S
13	184° 43'.6	337° 52'.4	51'.4	53° 27'.2	10'.2	77° 50'.6	25'.3	328° 23'.6	03'.8
14	199° 46'.1	352° 52'.1	52'.6	68° 28'.1	09'.8	92° 52'.6	25'.2	343° 25'.8	03'.9
15	214° 48'.6	7° 51'.9	53'.8	83° 28'.9	09'.4	107° 54'.7	25'.2	358° 28'.1	04'.0
16	229° 51'.0	22° 51'.7	55'.0	98° 29'.8	09'.0	122° 56'.7	25'.2	13° 30'.3	04'.1
17	244° 53'.5	37° 51'.4	56'.2	113° 30'.6	08'.7	137° 58'.8	25'.1	28° 32'.6	04'.1
18	259° 55'.9	52° 51'.2	57'.3	128° 31'.5	08'.3	153° 00'.8	25'.1	43° 34'.8	04'.2
19	274° 58'.4	67° 50'.9	58'.5	143° 32'.4	07'.9	168° 02'.9	25'.0	58° 37'.1	04'.3
20	290° 00'.9	82° 50'.7	59'.7	158° 33'.2	07'.5	183° 04'.9	25'.0	73° 39'.3	04'.4
21	305° 03'.3	97° 50'.5	12° 00'.9 S	173° 34'.1	07'.1	198° 07'.0	24'.9	88° 41'.6	04'.5
22	320° 05'.8	112° 50'.2	02'.1	188° 34'.9	06'.7	213° 09'.0	24'.9	103° 43'.8	04'.5
23	335° 08'.3	127° 50'.0	03'.2	203° 35'.8	06'.3	228° 11'.0	24'.9	118° 46'.1	04'.6
11 Wednesday 00	350° 10'.7	142° 49'.7	12° 04'.4 S	218° 36'.6	19° 05'.9 N	243° 13'.1	22° 24'.8 N	133° 48'.3	12° 04'.7 S
01	5° 13'.2	157° 49'.5	05'.6	233° 37'.5	05'.5	258° 15'.1	24'.8	148° 50'.5	04'.8
02	20° 15'.7	172° 49'.3	06'.8	248° 38'.3	05'.1	273° 17'.2	24'.7	163° 52'.8	04'.9
03	35° 18'.1	187° 49'.0	07'.9	263° 39'.2	04'.7	288° 19'.2	24'.7	178° 55'.0	04'.9
04	50° 20'.6	202° 48'.8	09'.1	278° 40'.0	04'.3	303° 21'.3	24'.7	193° 57'.3	05'.0
05	65° 23'.1	217° 48'.5	10'.3	293° 40'.9	03'.9	318° 23'.3	24'.6	208° 59'.5	05'.1
06	80° 25'.5	232° 48'.3	11'.5	308° 41'.7	03'.5	333° 25'.4	24'.6	224° 01'.8	05'.2
07	95° 28'.0	247° 48'.0	12'.6	323° 42'.6	03'.2	348° 27'.4	24'.5	239° 04'.0	05'.3
08	110° 30'.4	262° 47'.8	13'.8	338° 43'.4	02'.8	3° 29'.5	24'.5	254° 06'.3	05'.3
09	125° 32'.9	277° 47'.5	15'.0	353° 44'.3	02'.4	18° 31'.5	24'.4	269° 08'.5	05'.4
10	140° 35'.4	292° 47'.3	16'.2	8° 45'.1	02'.0	33° 33'.6	24'.4	284° 10'.8	05'.5
11	155° 37'.8	307° 47'.1	17'.3	23° 46'.0	01'.6	48° 35'.6	24'.4	299° 13'.0	05'.6
12	170° 40'.3	322° 46'.8	12° 18'.5 S	38° 46'.8	19° 01'.2 N	63° 37'.7	22° 24'.3 N	314° 15'.2	12° 05'.7 S
13	185° 42'.8	337° 46'.6	19'.7	53° 47'.7	00'.8	78° 39'.7	24'.3	329° 17'.5	05'.8
14	200° 45'.2	352° 46'.3	20'.9	68° 48'.6	00'.4	93° 41'.8	24'.2	344° 19'.7	05'.8
15	215° 47'.7	7° 46'.1	22'.0	83° 49'.4	00'.0	108° 43'.8	24'.2	359° 22'.0	05'.9
16	230° 50'.2	22° 45'.8	23'.2	98° 50'.3	18° 59'.6 N	123° 45'.9	24'.2	14° 24'.2	06'.0
17	245° 52'.6	37° 45'.6	24'.4	113° 51'.1	59'.2	138° 47'.9	24'.1	29° 26'.5	06'.1
18	260° 55'.1	52° 45'.3	25'.5	128° 52'.0	58'.8	153° 50'.0	24'.1	44° 28'.7	06'.2
19	275° 57'.5	67° 45'.1	26'.7	143° 52'.8	58'.4	168° 52'.0	24'.0	59° 31'.0	06'.2
20	291° 00'.0	82° 44'.8	27'.9	158° 53'.7	58'.0	183° 54'.1	24'.0	74° 33'.2	06'.3
21	306° 02'.5	97° 44'.6	29'.0	173° 54'.5	57'.6	198° 56'.1	24'.0	89° 35'.4	06'.4
22	321° 04'.9	112° 44'.4	30'.2	188° 55'.4	57'.2	213° 58'.2	23'.9	104° 37'.7	06'.5
23	336° 07'.4	127° 44'.1	31'.4	203° 56'.3	56'.8	229° 00'.2	23'.9	119° 39'.9	06'.6
12 Thursday 00	351° 09'.9	142° 43'.9	12° 32'.5 S	218° 57'.1	18° 56'.4 N	244° 02'.3	22° 23'.8 N	134° 42'.2	12° 06'.6 S
01	6° 12'.3	157° 43'.6	33'.7	233° 58'.0	56'.0	259° 04'.3	23'.8	149° 44'.4	06'.7
02	21° 14'.8	172° 43'.4	34'.9	248° 58'.8	55'.6	274° 06'.4	23'.7	164° 46'.7	06'.8
03	36° 17'.3	187° 43'.1	36'.0	263° 59'.7	55'.2	289° 08'.4	23'.7	179° 48'.9	06'.9
04	51° 19'.7	202° 42'.9	37'.2	279° 00'.6	54'.8	304° 10'.5	23'.7	194° 51'.1	07'.0
05	66° 22'.2	217° 42'.6	38'.4	294° 01'.4	54'.4	319° 12'.5	23'.6	209° 53'.4	07'.0
06	81° 24'.7	232° 42'.4	39'.5	309° 02'.3	54'.0	334° 14'.6	23'.6	224° 55'.6	07'.1
07	96° 27'.1	247° 42'.1	40'.7	324° 03'.1	53'.6	349° 16'.6	23'.5	239° 57'.9	07'.2
08	111° 29'.6	262° 41'.9	41'.9	339° 04'.0	53'.2	4° 18'.7	23'.5	255° 00'.1	07'.3
09	126° 32'.0	277° 41'.6	43'.0	354° 04'.8	52'.8	19° 20'.7	23'.5	270° 02'.4	07'.4
10	141° 34'.5	292° 41'.4	44'.2	9° 05'.7	52'.4	34° 22'.8	23'.4	285° 04'.6	07'.4
11	156° 37'.0	307° 41'.1	45'.4	24° 06'.6	52'.0	49° 24'.8	23'.4	300° 06'.8	07'.5
12	171° 39'.4	322° 40'.9	12° 46'.5 S	39° 07'.4	18° 51'.6 N	64° 26'.9	22° 23'.3 N	315° 09'.1	12° 07'.6 S
13	186° 41'.9	337° 40'.6	47'.7	54° 08'.3	51'.2	79° 28'.9	23'.3	330° 11'.3	07'.7
14	201° 44'.4	352° 40'.4	48'.8	69° 09'.1	50'.8	94° 31'.0	23'.3	345° 13'.6	07'.8
15	216° 46'.8	7° 40'.1	50'.0	84° 10'.0	50'.4	109° 33'.1	23'.2	0° 15'.8	07'.9
16	231° 49'.3	22° 39'.9	51'.2	99° 10'.9	50'.0	124° 35'.1	23'.2	15° 18'.1	07'.9
17	246° 51'.8	37° 39'.6	52'.3	114° 11'.7	49'.6	139° 37'.2	23'.1	30° 20'.3	08'.0
18	261° 54'.2	52° 39'.4	53'.5	129° 12'.6	49'.2	154° 39'.2	23'.1	45° 22'.5	08'.1
19	276° 56'.7	67° 39'.1	54'.6	144° 13'.4	48'.8	169° 41'.3	23'.1	60° 24'.8	08'.2
20	291° 59'.2	82° 38'.9	55'.8	159° 14'.3	48'.4	184° 43'.3	23'.0	75° 27'.0	08'.3
21	307° 01'.6	97° 38'.6	57'.0	174° 15'.2	48'.0	199° 45'.4	23'.0	90° 29'.3	08'.3
22	322° 04'.1	112° 38'.4	58'.1	189° 16'.0	47'.6	214° 47'.4	22'.9	105° 31'.5	08'.4
23	337° 06'.5	127° 38'.1	59'.3	204° 16'.9	47'.2	229° 49'.5	22'.9	120° 33'.7	08'.5
	M.P. 00:35	v -0'.2	d 1'.2	v 0'.9	d 0'.4	v 2'.0	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 18'.0	40° 14'.8 S
Achernar	335° 26'.2	57° 09'.8 S
Acrux	173° 09'.7	63° 10'.6 S
Adhara	255° 12'.5	28° 59'.4 S
Aldebaran	290° 49'.1	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.3 N
Alkaid	152° 59'.2	49° 14'.9 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.2	1° 11'.6 S
Alphard	217° 56'.2	8° 43'.1 S
Alphecca	126° 11'.0	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.1 N
Altair	62° 07'.9	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.7 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.8	69° 03'.2 S
Avior	234° 18'.4	59° 33'.1 S
Bellatrix	278° 31'.8	6° 21'.7 N
Betelgeuse	271° 01'.2	7° 24'.5 N
Canopus	263° 56'.2	52° 42'.0 S
Capella	280° 34'.2	46° 00'.4 N
Deneb	49° 31'.0	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.6 N
Elnath	278° 12'.4	28° 36'.9 N
Eltanin	90° 46'.0	51° 29'.7 N
Enif	33° 46'.6	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.5 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.0	60° 26'.4 S
Hamal	328° 00'.3	23° 31'.6 N
Kaus Aust.	83° 43'.5	34° 22'.6 S
Kochab	137° 20'.8	74° 06'.3 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.7	4° 08'.7 N
Menkent	148° 07'.6	36° 26'.2 S
Miaplacidus	221° 40'.3	69° 46'.4 S
Mirfak	308° 39'.8	49° 54'.4 N
Nunki	75° 57'.9	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.4 S
Polaris	317° 25'.8	89° 19'.1 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 06'.3	12° 33'.4 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 11'.9	8° 11'.1 S
Rigil Kent	139° 51'.8	60° 53'.6 S
Sabik	102° 12'.3	15° 44'.3 S
Schedar	349° 39'.7	56° 36'.8 N
Shaula	96° 21'.6	37° 06'.7 S
Sirius	258° 33'.7	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.7	43° 29'.2 S
Vega	80° 38'.7	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	152° 39'.0	14:29
Mars	228° 25'.9	09:25
Jupiter	253° 02'.4	07:46
Saturn	143° 37'.6	15:03

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP
180° 43'.9	4° 57'.3 N	129° 00'.4	8'.9	15° 16'.8 S	7'.4	58'.1
195° 44'.1	56'.3	143° 28'.3	8'.9	24'.2	7'.3	
210° 44'.3	55'.4	157° 56'.2	8'.8	31'.5	7'.2	
225° 44'.5	54'.4	172° 24'.0	8'.7	38'.7	7'.1	58'.2
240° 44'.7	53'.5	186° 51'.7	8'.7	45'.8	7'.0	
255° 45'.0	52'.5	201° 19'.4	8'.6	52'.8	7'.0	
270° 45'.2	51'.6	215° 47'.0	8'.6	59'.8	6'.8	
285° 45'.4	50'.6	230° 14'.6	8'.5	16° 06'.6 S	6'.8	
300° 45'.6	49'.7	244° 42'.1	8'.5	13'.4	6'.7	
315° 45'.8	48'.7	259° 09'.6	8'.3	20'.1	6'.5	58'.3
330° 46'.0	47'.8	273° 36'.9	8'.4	26'.6	6'.5	
345° 46'.3	46'.8	288° 04'.3	8'.2	33'.1	6'.4	
0° 46'.5	4° 45'.9 N	302° 31'.5	8'.3	16° 39'.5 S	6'.3	58'.3
15° 46'.7	44'.9	316° 58'.8	8'.1	45'.8	6'.2	
30° 46'.9	44'.0	331° 25'.9	8'.1	52'.0	6'.1	58'.4
45° 47'.1	43'.0	345° 53'.0	8'.1	58'.1	6'.0	
60° 47'.4	42'.1	0° 20'.1	7'.9	17° 04'.1 S	5'.9	
75° 47'.6	41'.1	14° 47'.0	8'.0	10'.0	5'.8	
90° 47'.8	40'.2	29° 14'.0	7'.9	15'.8	5'.7	
105° 48'.0	39'.3	43° 40'.9	7'.8	21'.5	5'.6	
120° 48'.2	38'.3	58° 07'.7	7'.7	27'.1	5'.5	58'.5
135° 48'.5	37'.4	72° 34'.4	7'.7	32'.6	5'.4	
150° 48'.7	36'.4	87° 01'.1	7'.7	38'.0	5'.3	
165° 48'.9	35'.5	101° 27'.8	7'.6	43'.3	5'.1	
180° 49'.1	4° 34'.5 N	115° 54'.4	7'.5	17° 48'.4 S	5'.1	58'.5
195° 49'.3	33'.6	130° 20'.9	7'.5	53'.5	5'.0	
210° 49'.5	32'.6	144° 47'.4	7'.5	58'.5	4'.8	58'.6
225° 49'.8	31'.6	159° 13'.9	7'.4	18° 03'.3 S	4'.8	
240° 50'.0	30'.7	173° 40'.3	7'.3	08'.1	4'.6	
255° 50'.2	29'.7	188° 06'.6	7'.3	12'.7	4'.5	
270° 50'.4	28'.8	202° 32'.9	7'.2	17'.2	4'.5	
285° 50'.6	27'.8	216° 59'.1	7'.2	21'.7	4'.3	
300° 50'.9	26'.9	231° 25'.3	7'.2	26'.0	4'.1	58'.7
315° 51'.1	25'.9	245° 51'.5	7'.1	30'.1	4'.1	
330° 51'.3	25'.0	260° 17'.6	7'.0	34'.2	4'.0	
345° 51'.5	24'.0	274° 43'.6	7'.0	38'.2	3'.8	
0° 51'.7	4° 23'.1 N	289° 09'.6	7'.0	18° 42'.0 S	3'.8	58'.7
15° 52'.0	22'.1	303° 35'.6	6'.9	45'.8	3'.6	
30° 52'.2	21'.2	318° 01'.5	6'.9	49'.4	3'.5	58'.8
45° 52'.4	20'.2	332° 27'.4	6'.8	52'.9	3'.4	
60° 52'.6	19'.3	346° 53'.2	6'.8	56'.3	3'.2	
75° 52'.8	18'.3	1° 19'.0	6'.7	59'.5	3'.2	
90° 53'.1	17'.4	15° 44'.7	6'.7	19° 02'.7 S	3'.0	
105° 53'.3	16'.4	30° 10'.4	6'.7	05'.7	2'.9	
120° 53'.5	15'.5	44° 36'.1	6'.6	08'.6	2'.8	
135° 53'.7	14'.5	59° 01'.7	6'.6	11'.4	2'.6	58'.9
150° 53'.9	13'.6	73° 27'.3	6'.5	14'.0	2'.6	
165° 54'.2	12'.6	87° 52'.8	6'.5	16'.6	2'.4	
180° 54'.4	4° 11'.7 N	102° 18'.3	6'.5	19° 19'.0 S	2'.3	58'.9
195° 54'.6	10'.7	116° 43'.8	6'.4	21'.3	2'.1	
210° 54'.8	09'.8	131° 09'.2	6'.4	23'.4	2'.1	
225° 55'.0	08'.8	145° 34'.6	6'.4	25'.5	1'.9	
240° 55'.3	07'.8	160° 00'.0	6'.3	27'.4	1'.8	59'.0
255° 55'.5	06'.9	174° 25'.3	6'.3	29'.2	1'.7	
270° 55'.7	05'.9	188° 50'.6	6'.3	30'.9	1'.5	
285° 55'.9	05'.0	203° 15'.9	6'.3	32'.4	1'.4	
300° 56'.2	04'.0	217° 41'.2	6'.2	33'.8	1'.3	
315° 56'.4	03'.1	232° 06'.4	6'.2	35'.1	1'.2	
330° 56'.6	02'.1	246° 31'.6	6'.1	36'.3	1'.0	59'.1
345° 56'.8	01'.2	260° 56'.7	6'.2	37'.3	0'.9	
0° 57'.0	4° 00'.2 N	275° 21'.9	6'.1	19° 38'.2 S	0'.8	59'.1
15° 57'.3	3° 59'.3 N	289° 47'.0	6'.1	39'.0	0'.7	
30° 57'.5	58'.3	304° 12'.1	6'.1	39'.7	0'.5	
45° 57'.7	57'.3	318° 37'.2	6'.0	40'.2	0'.4	
60° 57'.9	56'.4	333° 02'.2	6'.1	40'.6	0'.2	
75° 58'.1	55'.4	347° 27'.3	6'.0	40'.8	0'.2	
90° 58'.4	54'.5	1° 52'.3	6'.0	41'.0	0'.0	59'.2
105° 58'.6	53'.5	16° 17'.3	6'.0	41'.0	0'.1	
120° 58'.8	52'.6	30° 42'.3	5'.9	40'.9	0'.3	
135° 59'.0	51'.6	45° 07'.2	6'.0	40'.6	0'.4	
150° 59'.2	50'.7	59° 32'.2	5'.9	40'.2	0'.5	
165° 59'.5	49'.7	73° 57'.1	5'.9	39'.7	0'.6	
SD 15'.9	d 1'.0	SD 15'.9		16'.0	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12
N 72°	01:29	03:34	04:49	14:40	-	-
N 70°	02:13	03:50	04:57	13:42	15:38	17:20
68°	02:41	04:03	05:03	13:08	14:44	16:01
66°	03:02	04:14	05:08	12:43	14:11	15:23
64°	03:18	04:22	05:12	12:24	13:47	14:56
62°	03:31	04:29	05:15	12:09	13:28	14:35
60°	03:42	04:36	05:19	11:56	13:12	14:18
N 58°	03:51	04:41	05:21	11:45	12:59	14:04
56°	03:59	04:46	05:24	11:35	12:47	13:52
54°	04:06	04:50	05:26	11:27	12:37	13:42
52°	04:12	04:54	05:28	11:19	12:28	13:32
50°	04:18	04:57	05:30	11:12	12:20	13:24
45°	04:29	05:04	05:34	10:58	12:04	13:06
N 40°	04:38	05:10	05:37	10:46	11:50	12:51
35°	04:44	05:14	05:40	10:35	11:38	12:39
30°	04:50	05:18	05:42	10:27	11:28	12:28
20°	04:59	05:24	05:47	10:11	11:10	12:09
N 10°	05:04	05:29	05:50	09:58	10:55	11:53
0°	05:09	05:33	05:53	09:46	10:41	11:38
S 10°	05:11	05:35	05:56	09:33	10:27	11:23
20°	05:12	05:38	06:00	09:20	10:12	11:07
30°	05:12	05:39	06:03	09:05	09:55	10:49
35°	05:11	05:40	06:05	08:57	09:45	10:38
40°	05:09	05:40	06:07	08:47	09:33	10:26
45°	05:07	05:41	06:10	08:35	09:20	10:12
S 50°	05:03	05:41	06:13	08:22	09:04	09:54
52°	05:02	05:41	06:14	08:15	08:56	09:46
54°	05:00	05:40	06:16	08:08	08:48	09:37
56°	04:57	05:40	06:17	08:00	08:38	09:27
58°	04:55	05:40	06:19	07:51	08:28	09:15
S 60°	04:51	05:40	06:21	07:41	08:15	09:01
S 62°	04:48	05:39	06:23	07:29	08:01	08:45

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 10	Moonset 11	Moonset 12
N 72°	19:01	20:15	22:14	17:06	-	-
N 70°	18:54	19:59	21:34	18:05	18:05	18:24
68°	18:48	19:47	21:07	18:40	19:00	19:44
66°	18:44	19:37	20:48	19:05	19:34	20:22
64°	18:39	19:29	20:32	19:25	19:58	20:48
62°	18:36	19:22	20:19	19:41	20:17	21:09
60°	18:33	19:16	20:09	19:54	20:33	21:26
N 58°	18:30	19:10	20:00	20:05	20:47	21:40
56°	18:28	19:06	19:52	20:16	20:58	21:52
54°	18:26	19:02	19:45	20:24	21:08	22:03
52°	18:24	18:58	19:39	20:32	21:18	22:12
50°	18:22	18:55	19:34	20:40	21:26	22:21
45°	18:18	18:48	19:23	20:55	21:43	22:39
N 40°	18:15	18:43	19:15	21:08	21:57	22:53
35°	18:13	18:38	19:08	21:18	22:09	23:06
30°	18:10	18:34	19:02	21:28	22:20	23:16
20°	18:06	18:28	18:54	21:44	22:38	23:35
N 10°	18:03	18:24	18:48	21:58	22:53	23:51
0°	18:00	18:21	18:45	22:12	23:08	24:06
S 10°	17:57	18:18	18:42	22:25	23:23	24:21
20°	17:54	18:16	18:41	22:39	23:39	24:37
30°	17:50	18:14	18:42	22:56	23:57	24:55
35°	17:49	18:14	18:43	23:05	-	00:07
40°	17:46	18:13	18:45	23:16	-	00:19
45°	17:44	18:13	18:47	23:29	-	00:33
S 50°	17:41	18:13	18:51	23:45	-	00:51
52°	17:40	18:14	18:53	23:52	-	00:59
54°	17:38	18:14	18:55	-	00:00	01:08
56°	17:37	18:14	18:57	-	00:09	01:18
58°	17:35	18:14	19:00	-	00:20	01:30
S 60°	17:33	18:15	19:03	-	00:32	01:43
S 62°	17:31	18:15	19:07	-	00:46	01:59

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
10	2 55	3 06	11:57	15:59	03:32	5d 26%
11	3 16	3 27	11:57	16:55	04:26	6d 37%
12	3 37	3 48	11:56	17:52	05:23	7d 48%

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2013 September 13, 14, 15 (Fri, Sat, Sun)

GMT	ARIES	VENUS -4.1		MARS +1.6		JUPITER -2.1		SATURN +0.7	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
13 Friday 00	352° 09'.0	142° 37'.9	13° 00'.4 S	219° 17'.8	18° 46'.8 N	244° 51'.6	22° 22'.8 N	135° 36'.0	12° 08'.6 S
01	7° 11'.5	157° 37'.6	01'.6	234° 18'.6	46'.4	259° 53'.6	22'.8	150° 38'.2	08'.7
02	22° 13'.9	172° 37'.3	02'.7	249° 19'.5	46'.0	274° 55'.7	22'.8	165° 40'.5	08'.7
03	37° 16'.4	187° 37'.1	03'.9	264° 20'.3	45'.6	289° 57'.7	22'.7	180° 42'.7	08'.8
04	52° 18'.9	202° 36'.8	05'.0	279° 21'.2	45'.2	304° 59'.8	22'.7	195° 45'.0	08'.9
05	67° 21'.3	217° 36'.6	06'.2	294° 22'.1	44'.8	320° 01'.8	22'.6	210° 47'.2	09'.0
06	82° 23'.8	232° 36'.3	07'.3	309° 22'.9	44'.4	335° 03'.9	22'.6	225° 49'.4	09'.1
07	97° 26'.3	247° 36'.1	08'.5	324° 23'.8	44'.0	350° 06'.0	22'.6	240° 51'.7	09'.2
08	112° 28'.7	262° 35'.8	09'.7	339° 24'.7	43'.6	5° 08'.0	22'.5	255° 53'.9	09'.2
09	127° 31'.2	277° 35'.6	10'.8	354° 25'.5	43'.2	20° 10'.1	22'.5	270° 56'.2	09'.3
10	142° 33'.7	292° 35'.3	12'.0	9° 26'.4	42'.8	35° 12'.1	22'.4	285° 58'.4	09'.4
11	157° 36'.1	307° 35'.0	13'.1	24° 27'.3	42'.4	50° 14'.2	22'.4	301° 00'.6	09'.5
12	172° 38'.6	322° 34'.8	13° 14'.3 S	39° 28'.1	18° 42'.0 N	65° 16'.2	22° 22'.4 N	316° 02'.9	12° 09'.6 S
13	187° 41'.0	337° 34'.5	15'.4	54° 29'.0	41'.6	80° 18'.3	22'.3	331° 05'.1	09'.6
14	202° 43'.5	352° 34'.3	16'.6	69° 29'.9	41'.2	95° 20'.4	22'.3	346° 07'.4	09'.7
15	217° 46'.0	7° 34'.0	17'.7	84° 30'.7	40'.8	110° 22'.4	22'.2	1° 09'.6	09'.8
16	232° 48'.4	22° 33'.8	18'.9	99° 31'.6	40'.4	125° 24'.5	22'.2	16° 11'.8	09'.9
17	247° 50'.9	37° 33'.5	20'.0	114° 32'.5	40'.0	140° 26'.5	22'.1	31° 14'.1	10'.0
18	262° 53'.4	52° 33'.3	21'.2	129° 33'.3	39'.5	155° 28'.6	22'.1	46° 16'.3	10'.1
19	277° 55'.8	67° 33'.0	22'.3	144° 34'.2	39'.1	170° 30'.7	22'.1	61° 18'.6	10'.1
20	292° 58'.3	82° 32'.7	23'.4	159° 35'.1	38'.7	185° 32'.7	22'.0	76° 20'.8	10'.2
21	308° 00'.8	97° 32'.5	24'.6	174° 35'.9	38'.3	200° 34'.8	22'.0	91° 23'.0	10'.3
22	323° 03'.2	112° 32'.2	25'.7	189° 36'.8	37'.9	215° 36'.8	21'.9	106° 25'.3	10'.4
23	338° 05'.7	127° 32'.0	26'.9	204° 37'.7	37'.5	230° 38'.9	21'.9	121° 27'.5	10'.5
14 Saturday 00	353° 08'.1	142° 31'.7	13° 28'.0 S	219° 38'.5	18° 37'.1 N	245° 41'.0	22° 21'.9 N	136° 29'.7	12° 10'.5 S
01	8° 10'.6	157° 31'.4	29'.2	234° 39'.4	36'.7	260° 43'.0	21'.8	151° 32'.0	10'.6
02	23° 13'.1	172° 31'.2	30'.3	249° 40'.3	36'.3	275° 45'.1	21'.8	166° 34'.2	10'.7
03	38° 15'.5	187° 30'.9	31'.5	264° 41'.1	35'.9	290° 47'.2	21'.7	181° 36'.5	10'.8
04	53° 18'.0	202° 30'.7	32'.6	279° 42'.0	35'.5	305° 49'.2	21'.7	196° 38'.7	10'.9
05	68° 20'.5	217° 30'.4	33'.7	294° 42'.9	35'.1	320° 51'.3	21'.7	211° 40'.9	11'.0
06	83° 22'.9	232° 30'.1	34'.9	309° 43'.7	34'.7	335° 53'.3	21'.6	226° 43'.2	11'.0
07	98° 25'.4	247° 29'.9	36'.0	324° 44'.6	34'.3	350° 55'.4	21'.6	241° 45'.4	11'.1
08	113° 27'.9	262° 29'.6	37'.2	339° 45'.5	33'.9	5° 57'.5	21'.5	256° 47'.7	11'.2
09	128° 30'.3	277° 29'.4	38'.3	354° 46'.3	33'.4	20° 59'.5	21'.5	271° 49'.9	11'.3
10	143° 32'.8	292° 29'.1	39'.4	9° 47'.2	33'.0	36° 01'.6	21'.5	286° 52'.1	11'.4
11	158° 35'.3	307° 28'.8	40'.6	24° 48'.1	32'.6	51° 03'.7	21'.4	301° 54'.4	11'.4
12	173° 37'.7	322° 28'.6	13° 41'.7 S	39° 48'.9	18° 32'.2 N	66° 05'.7	22° 21'.4 N	316° 56'.6	12° 11'.5 S
13	188° 40'.2	337° 28'.3	42'.9	54° 49'.8	31'.8	81° 07'.8	21'.3	331° 58'.8	11'.6
14	203° 42'.6	352° 28'.0	44'.0	69° 50'.7	31'.4	96° 09'.9	21'.3	347° 01'.1	11'.7
15	218° 45'.1	7° 27'.8	45'.1	84° 51'.6	31'.0	111° 11'.9	21'.3	2° 03'.3	11'.8
16	233° 47'.6	22° 27'.5	46'.3	99° 52'.4	30'.6	126° 14'.0	21'.2	17° 05'.6	11'.9
17	248° 50'.0	37° 27'.3	47'.4	114° 53'.3	30'.2	141° 16'.1	21'.2	32° 07'.8	11'.9
18	263° 52'.5	52° 27'.0	48'.6	129° 54'.2	29'.8	156° 18'.1	21'.1	47° 10'.0	12'.0
19	278° 55'.0	67° 26'.7	49'.7	144° 55'.0	29'.3	171° 20'.2	21'.1	62° 12'.3	12'.1
20	293° 57'.4	82° 26'.5	50'.8	159° 55'.9	28'.9	186° 22'.3	21'.0	77° 14'.5	12'.2
21	308° 59'.9	97° 26'.2	52'.0	174° 56'.8	28'.5	201° 24'.3	21'.0	92° 16'.7	12'.3
22	324° 02'.4	112° 25'.9	53'.1	189° 57'.7	28'.1	216° 26'.4	21'.0	107° 19'.0	12'.4
23	339° 04'.8	127° 25'.7	54'.2	204° 58'.5	27'.7	231° 28'.5	20'.9	122° 21'.2	12'.4
15 Sunday 00	354° 07'.3	142° 25'.4	13° 55'.4 S	219° 59'.4	18° 27'.3 N	246° 30'.5	22° 20'.9 N	137° 23'.4	12° 12'.5 S
01	9° 09'.8	157° 25'.1	56'.5	235° 00'.3	26'.9	261° 32'.6	20'.8	152° 25'.7	12'.6
02	24° 12'.2	172° 24'.9	57'.6	250° 01'.2	26'.5	276° 34'.7	20'.8	167° 27'.9	12'.7
03	39° 14'.7	187° 24'.6	58'.8	265° 02'.0	26'.1	291° 36'.7	20'.8	182° 30'.2	12'.8
04	54° 17'.1	202° 24'.3	59'.9	280° 02'.9	25'.6	306° 38'.8	20'.7	197° 32'.4	12'.8
05	69° 19'.6	217° 24'.1	14° 01'.0 S	295° 03'.8	25'.2	321° 40'.9	20'.7	212° 34'.6	12'.9
06	84° 22'.1	232° 23'.8	02'.1	310° 04'.6	24'.8	336° 42'.9	20'.6	227° 36'.9	13'.0
07	99° 24'.5	247° 23'.5	03'.3	325° 05'.5	24'.4	351° 45'.0	20'.6	242° 39'.1	13'.1
08	114° 27'.0	262° 23'.3	04'.4	340° 06'.4	24'.0	6° 47'.1	20'.6	257° 41'.3	13'.2
09	129° 29'.5	277° 23'.0	05'.5	355° 07'.3	23'.6	21° 49'.1	20'.5	272° 43'.6	13'.3
10	144° 31'.9	292° 22'.7	06'.7	10° 08'.1	23'.2	36° 51'.2	20'.5	287° 45'.8	13'.3
11	159° 34'.4	307° 22'.5	07'.8	25° 09'.0	22'.8	51° 53'.3	20'.4	302° 48'.0	13'.4
12	174° 36'.9	322° 22'.2	14° 08'.9 S	40° 09'.9	18° 22'.3 N	66° 55'.4	22° 20'.4 N	317° 50'.3	12° 13'.5 S
13	189° 39'.3	337° 21'.9	10'.0	55° 10'.8	21'.9	81° 57'.4	20'.4	332° 52'.5	13'.6
14	204° 41'.8	352° 21'.7	11'.2	70° 11'.6	21'.5	96° 59'.5	20'.3	347° 54'.7	13'.7
15	219° 44'.3	7° 21'.4	12'.3	85° 12'.5	21'.1	112° 01'.6	20'.3	2° 57'.0	13'.8
16	234° 46'.7	22° 21'.1	13'.4	100° 13'.4	20'.7	127° 03'.6	20'.2	17° 59'.2	13'.8
17	249° 49'.2	37° 20'.9	14'.5	115° 14'.3	20'.3	142° 05'.7	20'.2	33° 01'.4	13'.9
18	264° 51'.6	52° 20'.6	15'.7	130° 15'.1	19'.9	157° 07'.8	20'.2	48° 03'.7	14'.0
19	279° 54'.1	67° 20'.3	16'.8	145° 16'.0	19'.4	172° 09'.8	20'.1	63° 05'.9	14'.1
20	294° 56'.6	82° 20'.1	17'.9	160° 16'.9	19'.0	187° 11'.9	20'.1	78° 08'.2	14'.2
21	309° 59'.0	97° 19'.8	19'.0	175° 17'.8	18'.6	202° 14'.0	20'.0	93° 10'.4	14'.3
22	325° 01'.5	112° 19'.5	20'.2	190° 18'.7	18'.2	217° 16'.1	20'.0	108° 12'.6	14'.3
23	340° 04'.0	127° 19'.2	21'.3	205° 19'.5	17'.8	232° 18'.1	20'.0	123° 14'.9	14'.4
	M.P. 00:23	v -0'.3	d 1'.1	v 0'.9	d 0'.4	v 2'.1	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 18'.0	40° 14'.8 S
Achernar	335° 26'.2	57° 09'.8 S
Acrux	173° 09'.7	63° 10'.6 S
Adhara	255° 12'.5	28° 59'.4 S
Aldebaran	290° 49'.1	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.3 N
Alkaid	152° 59'.2	49° 14'.9 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.2	1° 11'.6 S
Alphard	217° 56'.2	8° 43'.1 S
Alphecca	126° 11'.0	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.1 N
Altair	62° 07'.9	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.7 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.8	69° 03'.2 S
Avior	234° 18'.3	59° 33'.1 S
Bellatrix	278° 31'.8	6° 21'.7 N
Betelgeuse	271° 01'.1	7° 24'.5 N
Canopus	263° 56'.2	52° 42'.0 S
Capella	280° 34'.1	46° 00'.4 N
Deneb	49° 31'.0	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.5 N
Elnath	278° 12'.4	28° 36'.9 N
Eltanin	90° 46'.0	51° 29'.7 N
Enif	33° 46'.6	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.4 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.0	60° 26'.4 S
Hamal	328° 00'.3	23° 31'.6 N
Kaus Aust.	83° 43'.5	34° 22'.6 S
Kochab	137° 20'.8	74° 06'.3 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.7	4° 08'.7 N
Menkent	148° 07'.6	36° 26'.2 S
Miaplacidus	221° 40'.3	69° 46'.3 S
Mirfak	308° 39'.8	49° 54'.4 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.4 S
Polaris	317° 24'.4	89° 19'.1 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 06'.3	12° 33'.4 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 11'.9	8° 11'.1 S
Rigil Kent	139° 51'.8	60° 53'.6 S
Sabik	102° 12'.3	15° 44'.3 S
Schedar	349° 39'.7	56° 36'.8 N
Shaula	96° 21'.6	37° 06'.7 S
Sirius	258° 33'.7	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.6	43° 29'.2 S
Vega	80° 38'.7	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	149° 23'.6	14:30
Mars	226° 30'.4	09:21
Jupiter	252° 32'.8	07:36
Saturn	143° 21'.6	14:52

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
13 00	180° 59'.7	3° 48'.7 N	88° 22'.0	6'.0	19° 39'.1 S	0'.8	59'.2
01	195° 59'.9	47'.8	102° 47'.0	5'.9	38'.3	0'.9	
02	211° 00'.1	46'.8	117° 11'.9	5'.9	37'.4	1'.0	59'.3
03	226° 00'.4	45'.9	131° 36'.8	5'.9	36'.4	1'.2	
04	241° 00'.6	44'.9	146° 01'.7	5'.9	35'.2	1'.3	
05	256° 00'.8	44'.0	160° 26'.6	5'.8	33'.9	1'.4	
06	271° 01'.0	43'.0	174° 51'.4	5'.9	32'.5	1'.6	
07	286° 01'.2	42'.0	189° 16'.3	5'.9	30'.9	1'.6	
08	301° 01'.5	41'.1	203° 41'.2	5'.9	29'.3	1'.8	
09	316° 01'.7	40'.1	218° 06'.1	5'.8	27'.5	2'.0	
10	331° 01'.9	39'.2	232° 30'.9	5'.9	25'.5	2'.1	59'.4
11	346° 02'.1	38'.2	246° 55'.8	5'.9	23'.4	2'.2	
12	1° 02'.4	3° 37'.3 N	261° 20'.7	5'.9	19° 21'.2 S	2'.3	59'.4
13	16° 02'.6	36'.3	275° 45'.6	5'.8	18'.9	2'.4	
14	31° 02'.8	35'.3	290° 10'.4	5'.9	16'.5	2'.6	
15	46° 03'.0	34'.4	304° 35'.3	5'.9	13'.9	2'.8	
16	61° 03'.2	33'.4	319° 00'.2	5'.9	11'.1	2'.8	
17	76° 03'.5	32'.5	333° 25'.1	5'.9	08'.3	3'.0	
18	91° 03'.7	31'.5	347° 50'.0	6'.0	05'.3	3'.1	
19	106° 03'.9	30'.6	2° 15'.0	5'.9	02'.2	3'.2	
20	121° 04'.1	29'.6	16° 39'.9	5'.9	18° 59'.0 S	3'.4	59'.5
21	136° 04'.4	28'.6	31° 04'.8	6'.0	55'.6	3'.4	
22	151° 04'.6	27'.7	45° 29'.8	5'.9	52'.2	3'.7	
23	166° 04'.8	26'.7	59° 54'.7	6'.0	48'.5	3'.7	
14 00	181° 05'.0	3° 25'.8 N	74° 19'.7	6'.0	18° 44'.8 S	3'.8	59'.5
01	196° 05'.2	24'.8	88° 44'.7	6'.0	41'.0	4'.0	
02	211° 05'.5	23'.8	103° 09'.7	6'.1	37'.0	4'.1	
03	226° 05'.7	22'.9	117° 34'.8	6'.0	32'.9	4'.3	
04	241° 05'.9	21'.9	131° 59'.8	6'.1	28'.6	4'.3	
05	256° 06'.1	21'.0	146° 24'.9	6'.1	24'.3	4'.5	
06	271° 06'.4	20'.0	160° 50'.0	6'.1	19'.8	4'.6	
07	286° 06'.6	19'.0	175° 15'.1	6'.1	15'.2	4'.7	59'.6
08	301° 06'.8	18'.1	189° 40'.2	6'.1	10'.5	4'.9	
09	316° 07'.0	17'.1	204° 05'.3	6'.2	05'.6	5'.0	
10	331° 07'.2	16'.2	218° 30'.5	6'.2	00'.6	5'.0	
11	346° 07'.5	15'.2	232° 55'.7	6'.3	17° 55'.6 S	5'.3	
12	1° 07'.7	3° 14'.2 N	247° 21'.0	6'.2	17° 50'.3 S	5'.3	59'.6
13	16° 07'.9	13'.3	261° 46'.2	6'.3	45'.0	5'.4	
14	31° 08'.1	12'.3	276° 11'.5	6'.3	39'.6	5'.6	
15	46° 08'.4	11'.4	290° 36'.8	6'.3	34'.0	5'.7	
16	61° 08'.6	10'.4	305° 02'.1	6'.4	28'.3	5'.8	
17	76° 08'.8	09'.4	319° 27'.5	6'.4	22'.5	5'.9	
18	91° 09'.0	08'.5	333° 52'.9	6'.4	16'.6	6'.0	
19	106° 09'.3	07'.5	348° 18'.3	6'.5	10'.6	6'.1	
20	121° 09'.5	06'.6	2° 43'.8	6'.5	04'.5	6'.3	
21	136° 09'.7	05'.6	17° 09'.3	6'.5	16° 58'.2 S	6'.3	
22	151° 09'.9	04'.6	31° 34'.8	6'.6	51'.9	6'.5	
23	166° 10'.1	03'.7	46° 00'.4	6'.6	45'.4	6'.6	
15 00	181° 10'.4	3° 02'.7 N	60° 26'.0	6'.6	16° 38'.8 S	6'.7	59'.7
01	196° 10'.6	01'.8	74° 51'.6	6'.7	32'.1	6'.8	
02	211° 10'.8	00'.8	89° 17'.3	6'.7	25'.3	6'.9	
03	226° 11'.0	2° 59'.8 N	103° 43'.0	6'.7	18'.4	7'.0	
04	241° 11'.3	58'.9	118° 08'.7	6'.8	11'.4	7'.2	
05	256° 11'.5	57'.9	132° 34'.5	6'.8	04'.2	7'.2	
06	271° 11'.7	56'.9	147° 00'.3	6'.9	15° 57'.0 S	7'.3	
07	286° 11'.9	56'.0	161° 26'.2	6'.9	49'.7	7'.5	
08	301° 12'.2	55'.0	175° 52'.1	6'.9	42'.2	7'.5	
09	316° 12'.4	54'.1	190° 18'.0	7'.0	34'.7	7'.6	
10	331° 12'.6	53'.1	204° 44'.0	7'.0	27'.1	7'.8	
11	346° 12'.8	52'.1	219° 10'.0	7'.0	19'.3	7'.8	
12	1° 13'.1	2° 51'.2 N	233° 36'.0	7'.1	15° 11'.5 S	7'.9	59'.7
13	16° 13'.3	50'.2	248° 02'.1	7'.2	03'.6	8'.1	
14	31° 13'.5	49'.2	262° 28'.3	7'.1	14° 55'.5 S	8'.1	
15	46° 13'.7	48'.3	276° 54'.4	7'.3	47'.4	8'.2	
16	61° 13'.9	47'.3	291° 20'.7	7'.2	39'.2	8'.4	
17	76° 14'.2	46'.4	305° 46'.9	7'.3	30'.8	8'.4	
18	91° 14'.4	45'.4	320° 13'.2	7'.4	22'.4	8'.5	
19	106° 14'.6	44'.4	334° 39'.6	7'.4	13'.9	8'.6	
20	121° 14'.8	43'.5	349° 06'.0	7'.4	05'.3	8'.6	
21	136° 15'.1	42'.5	3° 32'.4	7'.5	13° 56'.7 S	8'.8	
22	151° 15'.3	41'.5	17° 58'.9	7'.5	47'.9	8'.9	
23	166° 15'.5	40'.6	32° 25'.4	7'.6	39'.0	8'.9	
	SD 15'.9	d 1'.0	SD 16'.2		16'.2		16'.3

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 13	Moonrise 14	Moonrise 15
N 72°	02:00	03:50	05:03	-	18:43	18:11
N 70°	02:34	04:04	05:09	17:43	17:43	17:41
68°	02:57	04:15	05:13	16:46	17:08	17:19
66°	03:15	04:24	05:17	16:12	16:43	17:01
64°	03:29	04:31	05:20	15:48	16:23	16:47
62°	03:41	04:38	05:23	15:28	16:07	16:35
60°	03:51	04:43	05:26	15:12	15:53	16:24
N 58°	03:59	04:48	05:28	14:59	15:42	16:15
56°	04:06	04:52	05:30	14:47	15:32	16:07
54°	04:12	04:56	05:31	14:37	15:23	16:00
52°	04:18	04:59	05:33	14:28	15:15	15:54
50°	04:23	05:02	05:34	14:20	15:08	15:48
45°	04:33	05:08	05:37	14:02	14:52	15:36
N 40°	04:41	05:13	05:40	13:48	14:39	15:25
35°	04:47	05:17	05:42	13:36	14:29	15:16
30°	04:52	05:20	05:44	13:25	14:19	15:08
20°	04:59	05:25	05:47	13:07	14:03	14:55
N 10°	05:04	05:29	05:50	12:51	13:48	14:43
0°	05:08	05:32	05:52	12:37	13:35	14:32
S 10°	05:09	05:34	05:55	12:22	13:21	14:21
20°	05:09	05:35	05:57	12:06	13:07	14:09
30°	05:08	05:36	05:59	11:48	12:51	13:55
35°	05:06	05:36	06:01	11:38	12:41	13:47
40°	05:04	05:35	06:02	11:26	12:30	13:38
45°	05:01	05:35	06:04	11:11	12:17	13:28
S 50°	04:57	05:34	06:06	10:54	12:02	13:15
52°	04:55	05:34	06:07	10:46	11:54	13:09
54°	04:52	05:33	06:08	10:37	11:46	13:02
56°	04:49	05:32	06:09	10:26	11:37	12:55
58°	04:46	05:32	06:11	10:15	11:26	12:46
S 60°	04:42	05:31	06:12	10:01	11:14	12:37
S 62°	04:38	05:30	06:14	09:45	11:00	12:26

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 13	Moonset 14	Moonset 15
N 72°	18:45	19:57	21:44	-	21:06	23:37
N 70°	18:40	19:44	21:12	20:04	22:05	24:05
68°	18:36	19:33	20:50	21:00	22:39	24:26
66°	18:32	19:25	20:33	21:33	23:04	24:43
64°	18:29	19:17	20:19	21:58	23:23	24:56
62°	18:26	19:11	20:08	22:17	23:38	25:08
60°	18:24	19:06	19:58	22:33	23:52	25:17
N 58°	18:22	19:02	19:50	22:46	-	00:03
56°	18:20	18:58	19:43	22:58	-	00:12
54°	18:18	18:54	19:37	23:08	-	00:21
52°	18:17	18:51	19:32	23:17	-	00:29
50°	18:16	18:48	19:27	23:25	-	00:35
45°	18:13	18:42	19:17	23:42	-	00:50
N 40°	18:10	18:37	19:09	23:55	-	01:02
35°	18:08	18:34	19:03	-	00:07	01:12
30°	18:07	18:30	18:59	-	00:17	01:21
20°	18:04	18:26	18:51	-	00:35	01:37
N 10°	18:01	18:22	18:46	-	00:50	01:50
0°	17:59	18:19	18:43	00:06	01:05	02:02
S 10°	17:57	18:18	18:42	00:21	01:19	02:15
20°	17:54	18:16	18:42	00:37	01:34	02:28
30°	17:52	18:16	18:44	00:55	01:51	02:43
35°	17:51	18:16	18:45	01:06	02:01	02:51
40°	17:49	18:16	18:48	01:18	02:13	03:01
45°	17:48	18:17	18:51	01:33	02:26	03:13
S 50°	17:46	18:18	18:55	01:50	02:42	03:26
52°	17:45	18:18	18:58	01:59	02:50	03:33
54°	17:44	18:19	19:00	02:08	02:58	03:40
56°	17:43	18:20	19:03	02:18	03:08	03:48
58°	17:42	18:21	19:07	02:30	03:19	03:57
S 60°	17:40	18:22	19:11	02:44	03:31	04:07
S 62°	17:39	18:23	19:15	03:00	03:46	04:18

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
13	3 58	4 09	11:56	18:51	06:21	8d 59%
14	4 20	4 30	11:55	19:49	07:20	9d 70%
15	4 41	4 52	11:55	20:45	08:17	10d 80%

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2013 September 16, 17, 18 (Mon, Tue, Wed)

GMT	ARIES	VENUS -4.1		MARS +1.6		JUPITER -2.1		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
16 Monday 00	355° 06'.4	142° 19'.0	14° 22'.4 S	220° 20'.4	18° 17'.4 N	247° 20'.2	22° 19'.9 N	138° 17'.1	12° 14'.5 S
01	10° 08'.9	157° 18'.7	23'.5	235° 21'.3	17'.0	262° 22'.3	19'.9	153° 19'.3	14'.6
02	25° 11'.4	172° 18'.4	24'.6	250° 22'.2	16'.5	277° 24'.4	19'.8	168° 21'.6	14'.7
03	40° 13'.8	187° 18'.2	25'.8	265° 23'.0	16'.1	292° 26'.4	19'.8	183° 23'.8	14'.8
04	55° 16'.3	202° 17'.9	26'.9	280° 23'.9	15'.7	307° 28'.5	19'.8	198° 26'.0	14'.8
05	70° 18'.7	217° 17'.6	28'.0	295° 24'.8	15'.3	322° 30'.6	19'.7	213° 28'.3	14'.9
06	85° 21'.2	232° 17'.3	29'.1	310° 25'.7	14'.9	337° 32'.7	19'.7	228° 30'.5	15'.0
07	100° 23'.7	247° 17'.1	30'.2	325° 26'.6	14'.5	352° 34'.7	19'.6	243° 32'.7	15'.1
08	115° 26'.1	262° 16'.8	31'.3	340° 27'.4	14'.0	7° 36'.8	19'.6	258° 35'.0	15'.2
09	130° 28'.6	277° 16'.5	32'.5	355° 28'.3	13'.6	22° 38'.9	19'.6	273° 37'.2	15'.3
10	145° 31'.1	292° 16'.2	33'.6	10° 29'.2	13'.2	37° 41'.0	19'.5	288° 39'.4	15'.3
11	160° 33'.5	307° 16'.0	34'.7	25° 30'.1	12'.8	52° 43'.0	19'.5	303° 41'.7	15'.4
12	175° 36'.0	322° 15'.7	14° 35'.8 S	40° 31'.0	18° 12'.4 N	67° 45'.1	22° 19'.4 N	318° 43'.9	12° 15'.5 S
13	190° 38'.5	337° 15'.4	36'.9	55° 31'.8	12'.0	82° 47'.2	19'.4	333° 46'.1	15'.6
14	205° 40'.9	352° 15'.1	38'.0	70° 32'.7	11'.5	97° 49'.3	19'.4	348° 48'.4	15'.7
15	220° 43'.4	7° 14'.9	39'.1	85° 33'.6	11'.1	112° 51'.3	19'.3	3° 50'.6	15'.8
16	235° 45'.9	22° 14'.6	40'.3	100° 34'.5	10'.7	127° 53'.4	19'.3	18° 52'.8	15'.8
17	250° 48'.3	37° 14'.3	41'.4	115° 35'.4	10'.3	142° 55'.5	19'.2	33° 55'.1	15'.9
18	265° 50'.8	52° 14'.0	42'.5	130° 36'.3	09'.9	157° 57'.6	19'.2	48° 57'.3	16'.0
19	280° 53'.2	67° 13'.8	43'.6	145° 37'.1	09'.4	172° 59'.6	19'.2	63° 59'.5	16'.1
20	295° 55'.7	82° 13'.5	44'.7	160° 38'.0	09'.0	188° 01'.7	19'.1	79° 01'.8	16'.2
21	310° 58'.2	97° 13'.2	45'.8	175° 38'.9	08'.6	203° 03'.8	19'.1	94° 04'.0	16'.3
22	326° 00'.6	112° 12'.9	46'.9	190° 39'.8	08'.2	218° 05'.9	19'.0	109° 06'.2	16'.3
23	341° 03'.1	127° 12'.7	48'.0	205° 40'.7	07'.8	233° 07'.9	19'.0	124° 08'.4	16'.4
17 Tuesday 00	356° 05'.6	142° 12'.4	14° 49'.1 S	220° 41'.5	18° 07'.3 N	248° 10'.0	22° 19'.0 N	139° 10'.7	12° 16'.5 S
01	11° 08'.0	157° 12'.1	50'.2	235° 42'.4	06'.9	263° 12'.1	18'.9	154° 12'.9	16'.6
02	26° 10'.5	172° 11'.8	51'.3	250° 43'.3	06'.5	278° 14'.2	18'.9	169° 15'.1	16'.7
03	41° 13'.0	187° 11'.5	52'.5	265° 44'.2	06'.1	293° 16'.3	18'.8	184° 17'.4	16'.8
04	56° 15'.4	202° 11'.3	53'.6	280° 45'.1	05'.7	308° 18'.3	18'.8	199° 19'.6	16'.8
05	71° 17'.9	217° 11'.0	54'.7	295° 46'.0	05'.2	323° 20'.4	18'.8	214° 21'.8	16'.9
06	86° 20'.4	232° 10'.7	55'.8	310° 46'.8	04'.8	338° 22'.5	18'.7	229° 24'.1	17'.0
07	101° 22'.8	247° 10'.4	56'.9	325° 47'.7	04'.4	353° 24'.6	18'.7	244° 26'.3	17'.1
08	116° 25'.3	262° 10'.2	58'.0	340° 48'.6	04'.0	8° 26'.7	18'.6	259° 28'.5	17'.2
09	131° 27'.7	277° 09'.9	59'.1	355° 49'.5	03'.6	23° 28'.7	18'.6	274° 30'.8	17'.3
10	146° 30'.2	292° 09'.6	15° 00'.2 S	10° 50'.4	03'.1	38° 30'.8	18'.6	289° 33'.0	17'.3
11	161° 32'.7	307° 09'.3	01'.3	25° 51'.3	02'.7	53° 32'.9	18'.5	304° 35'.2	17'.4
12	176° 35'.1	322° 09'.0	15° 02'.4 S	40° 52'.2	18° 02'.3 N	68° 35'.0	22° 18'.5 N	319° 37'.5	12° 17'.5 S
13	191° 37'.6	337° 08'.7	03'.5	55° 53'.0	01'.9	83° 37'.1	18'.4	334° 39'.7	17'.6
14	206° 40'.1	352° 08'.5	04'.6	70° 53'.9	01'.4	98° 39'.2	18'.4	349° 41'.9	17'.7
15	221° 42'.5	7° 08'.2	05'.7	85° 54'.8	01'.0	113° 41'.2	18'.4	4° 44'.1	17'.8
16	236° 45'.0	22° 07'.9	06'.8	100° 55'.7	00'.6	128° 43'.3	18'.3	19° 46'.4	17'.8
17	251° 47'.5	37° 07'.6	07'.9	115° 56'.6	00'.2	143° 45'.4	18'.3	34° 48'.6	17'.9
18	266° 49'.9	52° 07'.3	09'.0	130° 57'.5	17° 59'.8 N	158° 47'.5	18'.2	49° 50'.8	18'.0
19	281° 52'.4	67° 07'.1	10'.1	145° 58'.4	59'.3	173° 49'.6	18'.2	64° 53'.1	18'.1
20	296° 54'.8	82° 06'.8	11'.2	160° 59'.2	58'.9	188° 51'.6	18'.2	79° 55'.3	18'.2
21	311° 57'.3	97° 06'.5	12'.3	176° 00'.1	58'.5	203° 53'.7	18'.1	94° 57'.5	18'.3
22	326° 59'.8	112° 06'.2	13'.4	191° 01'.0	58'.1	218° 55'.8	18'.1	109° 59'.8	18'.3
23	342° 02'.2	127° 05'.9	14'.5	206° 01'.9	57'.6	233° 57'.9	18'.0	125° 02'.0	18'.4
18 Wednesday 00	357° 04'.7	142° 05'.6	15° 15'.6 S	221° 02'.8	17° 57'.2 N	249° 00'.0	22° 18'.0 N	140° 04'.2	12° 18'.5 S
01	12° 07'.2	157° 05'.4	16'.6	236° 03'.7	56'.8	264° 02'.1	18'.0	155° 06'.4	18'.6
02	27° 09'.6	172° 05'.1	17'.7	251° 04'.6	56'.4	279° 04'.1	17'.9	170° 08'.7	18'.7
03	42° 12'.1	187° 04'.8	18'.8	266° 05'.5	55'.9	294° 06'.2	17'.9	185° 10'.9	18'.8
04	57° 14'.6	202° 04'.5	19'.9	281° 06'.4	55'.5	309° 08'.3	17'.8	200° 13'.1	18'.9
05	72° 17'.0	217° 04'.2	21'.0	296° 07'.2	55'.1	324° 10'.4	17'.8	215° 15'.4	18'.9
06	87° 19'.5	232° 03'.9	22'.1	311° 08'.1	54'.7	339° 12'.5	17'.8	230° 17'.6	19'.0
07	102° 22'.0	247° 03'.6	23'.2	326° 09'.0	54'.2	354° 14'.6	17'.7	245° 19'.8	19'.1
08	117° 24'.4	262° 03'.4	24'.3	341° 09'.9	53'.8	9° 16'.7	17'.7	260° 22'.0	19'.2
09	132° 26'.9	277° 03'.1	25'.4	356° 10'.8	53'.4	24° 18'.7	17'.6	275° 24'.3	19'.3
10	147° 29'.3	292° 02'.8	26'.5	11° 11'.7	53'.0	39° 20'.8	17'.6	290° 26'.5	19'.4
11	162° 31'.8	307° 02'.5	27'.6	26° 12'.6	52'.5	54° 22'.9	17'.6	305° 28'.7	19'.4
12	177° 34'.3	322° 02'.2	15° 28'.6 S	41° 13'.5	17° 52'.1 N	69° 25'.0	22° 17'.5 N	320° 31'.0	12° 19'.5 S
13	192° 36'.7	337° 01'.9	29'.7	56° 14'.4	51'.7	84° 27'.1	17'.5	335° 33'.2	19'.6
14	207° 39'.2	352° 01'.6	30'.8	71° 15'.3	51'.3	99° 29'.2	17'.4	350° 35'.4	19'.7
15	222° 41'.7	7° 01'.3	31'.9	86° 16'.1	50'.8	114° 31'.3	17'.4	5° 37'.6	19'.8
16	237° 44'.1	22° 01'.1	33'.0	101° 17'.0	50'.4	129° 33'.4	17'.4	20° 39'.9	19'.9
17	252° 46'.6	37° 00'.8	34'.1	116° 17'.9	50'.0	144° 35'.4	17'.3	35° 42'.1	19'.9
18	267° 49'.1	52° 00'.5	35'.2	131° 18'.8	49'.6	159° 37'.5	17'.3	50° 44'.3	20'.0
19	282° 51'.5	67° 00'.2	36'.2	146° 19'.7	49'.1	174° 39'.6	17'.2	65° 46'.6	20'.1
20	297° 54'.0	81° 59'.9	37'.3	161° 20'.6	48'.7	189° 41'.7	17'.2	80° 48'.8	20'.2
21	312° 56'.4	96° 59'.6	38'.4	176° 21'.5	48'.3	204° 43'.8	17'.2	95° 51'.0	20'.3
22	327° 58'.9	111° 59'.3	39'.5	191° 22'.4	47'.8	219° 45'.9	17'.1	110° 53'.2	20'.4
23	343° 01'.4	126° 59'.0	40'.6	206° 23'.3	47'.4	234° 48'.0	17'.1	125° 55'.5	20'.5
	M.P. 00:12	v -0'.3	d 1'.1	v 0'.9	d 0'.4	v 2'.1	d 0'.0	v 2'.2	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 18'.0	40° 14'.8 S
Achernar	335° 26'.2	57° 09'.8 S
Acrux	173° 09'.7	63° 10'.6 S
Adhara	255° 12'.5	28° 59'.4 S
Aldebaran	290° 49'.1	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.2 N
Alkaid	152° 59'.2	49° 14'.9 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.2	1° 11'.6 S
Alphard	217° 56'.2	8° 43'.1 S
Alphecca	126° 11'.0	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.1 N
Altair	62° 07'.9	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.7 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.8	69° 03'.2 S
Avior	234° 18'.3	59° 33'.1 S
Bellatrix	278° 31'.8	6° 21'.7 N
Betelgeuse	271° 01'.1	7° 24'.5 N
Canopus	263° 56'.2	52° 42'.0 S
Capella	280° 34'.1	46° 00'.4 N
Deneb	49° 31'.0	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.5 N
Elnath	278° 12'.4	28° 36'.9 N
Eltanin	90° 46'.0	51° 29'.7 N
Enif	33° 46'.6	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.4 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.4 S
Hamal	328° 00'.3	23° 31'.7 N
Kaus Aust.	83° 43'.5	34° 22'.6 S
Kochab	137° 20'.9	74° 06'.2 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.6	4° 08'.7 N
Menkent	148° 07'.6	36° 26'.2 S
Miaplacidus	221° 40'.3	69° 46'.3 S
Mirfak	308° 39'.8	49° 54'.4 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.4 S
Polaris	317° 23'.3	89° 19'.1 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 06'.3	12° 33'.4 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 11'.8	8° 11'.1 S
Rigil Kent	139° 51'.8	60° 53'.6 S
Sabik	102° 12'.4	15° 44'.3 S
Schedar	349° 39'.7	56° 36'.8 N
Shaula	96° 21'.7	37° 06'.7 S
Sirius	258° 33'.6	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.6	43° 29'.2 S
Vega	80° 38'.7	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	146° 06'.8	14:31
Mars	224° 36'.0	09:17
Jupiter	252° 04'.5	07:26
Saturn	143° 05'.1	14:41

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
181° 15'.7	2° 39'.6 N	46° 52'.0	7'.6	13° 30'.1 S	9'.0	59'.7
196° 16'.0	38'.7	61° 18'.6	7'.7	21'.1	9'.2	
211° 16'.2	37'.7	75° 45'.3	7'.7	11'.9	9'.1	
226° 16'.4	36'.7	90° 12'.0	7'.8	02'.8	9'.3	
241° 16'.6	35'.8	104° 38'.8	7'.8	12° 53'.5 S	9'.4	
256° 16'.9	34'.8	119° 05'.6	7'.8	44'.1	9'.4	
271° 17'.1	33'.8	133° 32'.4	7'.9	34'.7	9'.5	
286° 17'.3	32'.9	147° 59'.3	7'.9	25'.2	9'.6	
301° 17'.5	31'.9	162° 26'.2	8'.0	15'.6	9'.7	
316° 17'.7	30'.9	176° 53'.2	8'.0	05'.9	9'.7	59'.6
331° 18'.0	30'.0	191° 20'.2	8'.1	11° 56'.2 S	9'.8	
346° 18'.2	29'.0	205° 47'.3	8'.1	46'.4	9'.9	
1° 18'.4	2° 28'.1 N	220° 14'.4	8'.2	11° 36'.5 S	10'.0	59'.6
16° 18'.6	27'.1	234° 41'.6	8'.2	26'.5	10'.0	
31° 18'.9	26'.1	249° 08'.8	8'.2	16'.5	10'.1	
46° 19'.1	25'.2	263° 36'.0	8'.3	06'.4	10'.1	
61° 19'.3	24'.2	278° 03'.3	8'.4	10° 56'.3 S	10'.2	
76° 19'.5	23'.2	292° 30'.7	8'.4	46'.1	10'.3	
91° 19'.8	22'.3	306° 58'.1	8'.4	35'.8	10'.4	
106° 20'.0	21'.3	321° 25'.5	8'.5	25'.4	10'.4	
121° 20'.2	20'.3	335° 53'.0	8'.5	15'.0	10'.5	
136° 20'.4	19'.4	350° 20'.5	8'.6	04'.5	10'.5	
151° 20'.7	18'.4	4° 48'.1	8'.6	9° 54'.0 S	10'.6	
166° 20'.9	17'.4	19° 15'.7	8'.7	43'.4	10'.6	
181° 21'.1	2° 16'.5 N	33° 43'.4	8'.7	9° 32'.8 S	10'.7	59'.5
196° 21'.3	15'.5	48° 11'.1	8'.7	22'.1	10'.8	
211° 21'.6	14'.5	62° 38'.8	8'.8	11'.3	10'.8	
226° 21'.8	13'.6	77° 06'.6	8'.8	00'.5	10'.8	
241° 22'.0	12'.6	91° 34'.4	8'.9	8° 49'.7 S	10'.9	
256° 22'.2	11'.6	106° 02'.3	8'.9	38'.8	11'.0	
271° 22'.5	10'.7	120° 30'.2	9'.0	27'.8	11'.0	
286° 22'.7	09'.7	134° 58'.2	9'.0	16'.8	11'.0	
301° 22'.9	08'.7	149° 26'.2	9'.1	05'.8	11'.1	
316° 23'.1	07'.8	163° 54'.3	9'.1	7° 54'.7 S	11'.1	
331° 23'.3	06'.8	178° 22'.4	9'.1	43'.6	11'.2	59'.4
346° 23'.6	05'.8	192° 50'.5	9'.2	32'.4	11'.2	
1° 23'.8	2° 04'.9 N	207° 18'.7	9'.2	7° 21'.2 S	11'.2	59'.4
16° 24'.0	03'.9	221° 46'.9	9'.2	10'.0	11'.3	
31° 24'.2	02'.9	236° 15'.1	9'.3	6° 58'.7 S	11'.4	
46° 24'.5	02'.0	250° 43'.4	9'.4	47'.3	11'.3	
61° 24'.7	01'.0	265° 11'.8	9'.4	36'.0	11'.4	
76° 24'.9	00'.0	279° 40'.2	9'.4	24'.6	11'.4	
91° 25'.1	1° 59'.1 N	294° 08'.6	9'.4	13'.2	11'.5	59'.3
106° 25'.4	58'.1	308° 37'.0	9'.5	01'.7	11'.5	
121° 25'.6	57'.1	323° 05'.5	9'.6	5° 50'.2 S	11'.5	
136° 25'.8	56'.2	337° 34'.1	9'.5	38'.7	11'.5	
151° 26'.0	55'.2	352° 02'.6	9'.6	27'.2	11'.6	
166° 26'.3	54'.2	6° 31'.2	9'.7	15'.6	11'.6	
181° 26'.5	1° 53'.3 N	20° 59'.9	9'.7	5° 04'.0 S	11'.6	59'.2
196° 26'.7	52'.3	35° 28'.6	9'.7	4° 52'.4 S	11'.7	
211° 26'.9	51'.3	49° 57'.3	9'.7	40'.7	11'.6	
226° 27'.2	50'.4	64° 26'.0	9'.8	29'.1	11'.7	
241° 27'.4	49'.4	78° 54'.8	9'.9	17'.4	11'.7	
256° 27'.6	48'.4	93° 23'.7	9'.8	05'.7	11'.7	
271° 27'.8	47'.5	107° 52'.5	9'.9	3° 54'.0 S	11'.7	59'.1
286° 28'.0	46'.5	122° 21'.4	9'.9	42'.3	11'.8	
301° 28'.3	45'.5	136° 50'.3	10'.0	30'.5	11'.7	
316° 28'.5	44'.6	151° 19'.3	10'.0	18'.8	11'.8	
331° 28'.7	43'.6	165° 48'.3	10'.0	07'.0	11'.8	
346° 28'.9	42'.6	180° 17'.3	10'.1	2° 55'.2 S	11'.8	
1° 29'.2	1° 41'.7 N	194° 46'.4	10'.1	2° 43'.4 S	11'.8	59'.0
16° 29'.4	40'.7	209° 15'.5	10'.1	31'.6	11'.8	
31° 29'.6	39'.7	223° 44'.6	10'.2	19'.8	11'.8	
46° 29'.8	38'.8	238° 13'.8	10'.1	08'.0	11'.8	
61° 30'.1	37'.8	252° 42'.9	10'.3	1° 56'.2 S	11'.8	
76° 30'.3	36'.8	267° 12'.2	10'.2	44'.4	11'.8	58'.9
91° 30'.5	35'.9	281° 41'.4	10'.3	32'.6	11'.8	
106° 30'.7	34'.9	296° 10'.7	10'.3	20'.8	11'.8	
121° 31'.0	33'.9	310° 40'.0	10'.3	09'.0	11'.8	
136° 31'.2	33'.0	325° 09'.3	10'.3	0° 57'.2 S	11'.8	
151° 31'.4	32'.0	339° 38'.6	10'.4	45'.4	11'.8	58'.8
166° 31'.6	31'.0	354° 08'.0	10'.4	33'.6	11'.8	
SD 15'.9	d 1'.0	SD	16'.2	16'.2	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18
N 72°	02:25	04:06	05:17	17:55	17:44	17:34
N 70°	02:52	04:17	05:21	17:38	17:35	17:32
68°	03:12	04:27	05:24	17:24	17:28	17:30
66°	03:27	04:34	05:27	17:13	17:21	17:28
64°	03:40	04:41	05:29	17:03	17:16	17:27
62°	03:50	04:46	05:31	16:55	17:12	17:26
60°	03:59	04:51	05:33	16:48	17:08	17:25
N 58°	04:06	04:55	05:34	16:42	17:04	17:24
56°	04:13	04:58	05:36	16:36	17:01	17:23
54°	04:18	05:01	05:37	16:31	16:58	17:22
52°	04:23	05:04	05:38	16:27	16:55	17:21
50°	04:28	05:06	05:39	16:23	16:53	17:21
45°	04:37	05:12	05:41	16:14	16:48	17:19
N 40°	04:44	05:16	05:43	16:06	16:43	17:18
35°	04:49	05:19	05:44	16:00	16:40	17:17
30°	04:54	05:22	05:46	15:54	16:36	17:16
20°	05:00	05:26	05:48	15:44	16:30	17:15
N 10°	05:04	05:29	05:50	15:35	16:25	17:13
0°	05:06	05:31	05:51	15:27	16:21	17:12
S 10°	05:07	05:32	05:53	15:19	16:16	17:11
20°	05:07	05:32	05:54	15:10	16:11	17:10
30°	05:04	05:32	05:56	15:00	16:05	17:08
35°	05:02	05:31	05:57	14:55	16:01	17:07
40°	04:59	05:31	05:57	14:48	15:58	17:06
45°	04:55	05:29	05:59	14:40	15:53	17:05
S 50°	04:50	05:28	06:00	14:31	15:48	17:04
52°	04:47	05:27	06:00	14:27	15:45	17:03
54°	04:44	05:26	06:01	14:22	15:43	17:03
56°	04:41	05:25	06:01	14:17	15:40	17:02
58°	04:37	05:23	06:02	14:11	15:36	17:01
S 60°	04:33	05:22	06:03	14:04	15:33	17:00
S 62°	04:27	05:20	06:04	13:57	15:28	16:59

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 16	Moonset 17	Moonset 18
N 72°	18:30	19:40	21:18	-	01:47	03:48
N 70°	18:26	19:29	20:52	00:05	02:02	03:55
68°	18:23	19:20	20:33	00:26	02:14	04:00
66°	18:20	19:12	20:18	00:43	02:24	04:04
64°	18:18	19:06	20:06	00:56	02:32	04:08
62°	18:16	19:01	19:56	01:08	02:40	04:11
60°	18:15	18:57	19:48	01:17	02:46	04:14
N 58°	18:13	18:53	19:41	01:26	02:51	04:17
56°	18:12	18:49	19:34	01:33	02:56	04:19
54°	18:11	18:46	19:29	01:39	03:00	04:21
52°	18:10	18:44	19:24	01:45	03:04	04:22
50°	18:09	18:41	19:20	01:51	03:07	04:24
45°	18:07	18:36	19:11	02:02	03:15	04:28
N 40°	18:05	18:32	19:04	02:11	03:21	04:31
35°	18:04	18:29	18:59	02:19	03:26	04:33
30°	18:03	18:27	18:55	02:26	03:31	04:35
20°	18:01	18:23	18:48	02:38	03:39	04:39
N 10°	17:59	18:20	18:45	02:49	03:46	04:42
0°	17:58	18:18	18:42	02:59	03:53	04:45
S 10°	17:56	18:17	18:42	03:08	03:59	04:48
20°	17:55	18:17	18:43	03:18	04:06	04:51
30°	17:54	18:17	18:45	03:30	04:14	04:55
35°	17:53	18:18	18:47	03:37	04:18	04:57
40°	17:52	18:19	18:51	03:44	04:23	04:59
45°	17:51	18:20	18:55	03:53	04:29	05:02
S 50°	17:50	18:22	19:00	04:04	04:36	05:05
52°	17:50	18:23	19:03	04:09	04:39	05:07
54°	17:49	18:24	19:06	04:14	04:43	05:08
56°	17:49	18:26	19:09	04:20	04:47	05:10
58°	17:48	18:27	19:13	04:27	04:51	05:12
S 60°	17:47	18:29	19:18	04:34	04:56	05:14
S 62°	17:46	18:31	19:23	04:42	05:01	05:16

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
16	5 02	5 13	11:55	21:40	09:13	11d 89%
17	5 24	5 35	11:54	22:33	10:07	12d 95%
18	5 45	5 56	11:54	23:24	10:59	13d 99%

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2013 September 19, 20, 21 (Thur, Fri, Sat)

GMT	ARIES	VENUS -4.1		MARS +1.6		JUPITER -2.1		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
19 Thursday 00	358° 03'.8	141° 58'.7	15° 41'.7 S	221° 24'.2	17° 47'.0 N	249° 50'.1	22° 17'.0 N	140° 57'.7	12° 20'.5 S
01	13° 06'.3	156° 58'.4	42'.7	236° 25'.1	46'.6	264° 52'.2	17'.0	155° 59'.9	20'.6
02	28° 08'.8	171° 58'.2	43'.8	251° 26'.0	46'.1	279° 54'.3	17'.0	171° 02'.1	20'.7
03	43° 11'.2	186° 57'.9	44'.9	266° 26'.9	45'.7	294° 56'.3	16'.9	186° 04'.4	20'.8
04	58° 13'.7	201° 57'.6	46'.0	281° 27'.8	45'.3	309° 58'.4	16'.9	201° 06'.6	20'.9
05	73° 16'.2	216° 57'.3	47'.0	296° 28'.6	44'.8	325° 00'.5	16'.8	216° 08'.8	21'.0
06	88° 18'.6	231° 57'.0	48'.1	311° 29'.5	44'.4	340° 02'.6	16'.8	231° 11'.1	21'.0
07	103° 21'.1	246° 56'.7	49'.2	326° 30'.4	44'.0	355° 04'.7	16'.8	246° 13'.3	21'.1
08	118° 23'.6	261° 56'.4	50'.3	341° 31'.3	43'.6	10° 06'.8	16'.7	261° 15'.5	21'.2
09	133° 26'.0	276° 56'.1	51'.4	356° 32'.2	43'.1	25° 08'.9	16'.7	276° 17'.7	21'.3
10	148° 28'.5	291° 55'.8	52'.4	11° 33'.1	42'.7	40° 11'.0	16'.6	291° 20'.0	21'.4
11	163° 30'.9	306° 55'.5	53'.5	26° 34'.0	42'.3	55° 13'.1	16'.6	306° 22'.2	21'.5
12	178° 33'.4	321° 55'.2	15° 54'.6 S	41° 34'.9	17° 41'.8 N	70° 15'.2	22° 16'.6 N	321° 24'.4	12° 21'.6 S
13	193° 35'.9	336° 54'.9	55'.6	56° 35'.8	41'.4	85° 17'.3	16'.5	336° 26'.6	21'.6
14	208° 38'.3	351° 54'.6	56'.7	71° 36'.7	41'.0	100° 19'.4	16'.5	351° 28'.9	21'.7
15	223° 40'.8	6° 54'.3	57'.8	86° 37'.6	40'.5	115° 21'.4	16'.5	6° 31'.1	21'.8
16	238° 43'.3	21° 54'.0	58'.9	101° 38'.5	40'.1	130° 23'.5	16'.4	21° 33'.3	21'.9
17	253° 45'.7	36° 53'.7	59'.9	116° 39'.4	39'.7	145° 25'.6	16'.4	36° 35'.5	22'.0
18	268° 48'.2	51° 53'.5	16° 01'.0 S	131° 40'.3	39'.2	160° 27'.7	16'.3	51° 37'.8	22'.1
19	283° 50'.7	66° 53'.2	02'.1	146° 41'.2	38'.8	175° 29'.8	16'.3	66° 40'.0	22'.1
20	298° 53'.1	81° 52'.9	03'.1	161° 42'.1	38'.4	190° 31'.9	16'.3	81° 42'.2	22'.2
21	313° 55'.6	96° 52'.6	04'.2	176° 43'.0	38'.0	205° 34'.0	16'.2	96° 44'.4	22'.3
22	328° 58'.0	111° 52'.3	05'.3	191° 43'.9	37'.5	220° 36'.1	16'.2	111° 46'.7	22'.4
23	344° 00'.5	126° 52'.0	06'.3	206° 44'.8	37'.1	235° 38'.2	16'.1	126° 48'.9	22'.5
20 Friday 00	359° 03'.0	141° 51'.7	16° 07'.4 S	221° 45'.7	17° 36'.7 N	250° 40'.3	22° 16'.1 N	141° 51'.1	12° 22'.6 S
01	14° 05'.4	156° 51'.4	08'.5	236° 46'.6	36'.2	265° 42'.4	16'.1	156° 53'.3	22'.7
02	29° 07'.9	171° 51'.1	09'.5	251° 47'.5	35'.8	280° 44'.5	16'.0	171° 55'.6	22'.7
03	44° 10'.4	186° 50'.8	10'.6	266° 48'.4	35'.4	295° 46'.6	16'.0	186° 57'.8	22'.8
04	59° 12'.8	201° 50'.5	11'.7	281° 49'.3	34'.9	310° 48'.7	15'.9	202° 00'.0	22'.9
05	74° 15'.3	216° 50'.2	12'.7	296° 50'.2	34'.5	325° 50'.8	15'.9	217° 02'.2	23'.0
06	89° 17'.8	231° 49'.9	13'.8	311° 51'.1	34'.1	340° 52'.9	15'.9	232° 04'.5	23'.1
07	104° 20'.2	246° 49'.6	14'.9	326° 52'.0	33'.6	355° 55'.0	15'.8	247° 06'.7	23'.2
08	119° 22'.7	261° 49'.3	15'.9	341° 52'.9	33'.2	10° 57'.1	15'.8	262° 08'.9	23'.3
09	134° 25'.2	276° 49'.0	17'.0	356° 53'.8	32'.8	25° 59'.2	15'.7	277° 11'.1	23'.3
10	149° 27'.6	291° 48'.7	18'.1	11° 54'.7	32'.3	41° 01'.3	15'.7	292° 13'.4	23'.4
11	164° 30'.1	306° 48'.4	19'.1	26° 55'.6	31'.9	56° 03'.4	15'.7	307° 15'.6	23'.5
12	179° 32'.5	321° 48'.1	16° 20'.2 S	41° 56'.5	17° 31'.5 N	71° 05'.5	22° 15'.6 N	322° 17'.8	12° 23'.6 S
13	194° 35'.0	336° 47'.8	21'.2	56° 57'.4	31'.0	86° 07'.6	15'.6	337° 20'.0	23'.7
14	209° 37'.5	351° 47'.5	22'.3	71° 58'.3	30'.6	101° 09'.7	15'.6	352° 22'.3	23'.8
15	224° 39'.9	6° 47'.2	23'.3	86° 59'.2	30'.2	116° 11'.8	15'.5	7° 24'.5	23'.8
16	239° 42'.4	21° 46'.9	24'.4	102° 00'.1	29'.7	131° 13'.9	15'.5	22° 26'.7	23'.9
17	254° 44'.9	36° 46'.6	25'.5	117° 01'.0	29'.3	146° 16'.0	15'.4	37° 28'.9	24'.0
18	269° 47'.3	51° 46'.3	26'.5	132° 01'.9	28'.8	161° 18'.1	15'.4	52° 31'.2	24'.1
19	284° 49'.8	66° 46'.0	27'.6	147° 02'.8	28'.4	176° 20'.2	15'.4	67° 33'.4	24'.2
20	299° 52'.3	81° 45'.7	28'.6	162° 03'.7	28'.0	191° 22'.3	15'.3	82° 35'.6	24'.3
21	314° 54'.7	96° 45'.3	29'.7	177° 04'.6	27'.5	206° 24'.4	15'.3	97° 37'.8	24'.4
22	329° 57'.2	111° 45'.0	30'.7	192° 05'.5	27'.1	221° 26'.5	15'.2	112° 40'.1	24'.4
23	344° 59'.6	126° 44'.7	31'.8	207° 06'.4	26'.7	236° 28'.6	15'.2	127° 42'.3	24'.5
21 Saturday 00	0° 02'.1	141° 44'.4	16° 32'.8 S	222° 07'.3	17° 26'.2 N	251° 30'.7	22° 15'.2 N	142° 44'.5	12° 24'.6 S
01	15° 04'.6	156° 44'.1	33'.9	237° 08'.2	25'.8	266° 32'.8	15'.1	157° 46'.7	24'.7
02	30° 07'.0	171° 43'.8	34'.9	252° 09'.1	25'.4	281° 34'.9	15'.1	172° 48'.9	24'.8
03	45° 09'.5	186° 43'.5	36'.0	267° 10'.0	24'.9	296° 37'.0	15'.0	187° 51'.2	24'.9
04	60° 12'.0	201° 43'.2	37'.0	282° 10'.9	24'.5	311° 39'.1	15'.0	202° 53'.4	25'.0
05	75° 14'.4	216° 42'.9	38'.1	297° 11'.8	24'.0	326° 41'.2	15'.0	217° 55'.6	25'.0
06	90° 16'.9	231° 42'.6	39'.1	312° 12'.7	23'.6	341° 43'.3	14'.9	232° 57'.8	25'.1
07	105° 19'.4	246° 42'.3	40'.2	327° 13'.6	23'.2	356° 45'.4	14'.9	248° 00'.1	25'.2
08	120° 21'.8	261° 42'.0	41'.2	342° 14'.5	22'.7	11° 47'.5	14'.9	263° 02'.3	25'.3
09	135° 24'.3	276° 41'.7	42'.3	357° 15'.4	22'.3	26° 49'.6	14'.8	278° 04'.5	25'.4
10	150° 26'.8	291° 41'.4	43'.3	12° 16'.3	21'.9	41° 51'.7	14'.8	293° 06'.7	25'.5
11	165° 29'.2	306° 41'.1	44'.4	27° 17'.2	21'.4	56° 53'.8	14'.7	308° 08'.9	25'.6
12	180° 31'.7	321° 40'.8	16° 45'.4 S	42° 18'.1	17° 21'.0 N	71° 55'.9	22° 14'.7 N	323° 11'.2	12° 25'.6 S
13	195° 34'.1	336° 40'.4	46'.5	57° 19'.0	20'.5	86° 58'.0	14'.7	338° 13'.4	25'.7
14	210° 36'.6	351° 40'.1	47'.5	72° 20'.0	20'.1	102° 00'.1	14'.6	353° 15'.6	25'.8
15	225° 39'.1	6° 39'.8	48'.5	87° 20'.9	19'.7	117° 02'.2	14'.6	8° 17'.8	25'.9
16	240° 41'.5	21° 39'.5	49'.6	102° 21'.8	19'.2	132° 04'.3	14'.5	23° 20'.1	26'.0
17	255° 44'.0	36° 39'.2	50'.6	117° 22'.7	18'.8	147° 06'.4	14'.5	38° 22'.3	26'.1
18	270° 46'.5	51° 38'.9	51'.7	132° 23'.6	18'.4	162° 08'.5	14'.5	53° 24'.5	26'.2
19	285° 48'.9	66° 38'.6	52'.7	147° 24'.5	17'.9	177° 10'.6	14'.4	68° 26'.7	26'.2
20	300° 51'.4	81° 38'.3	53'.7	162° 25'.4	17'.5	192° 12'.8	14'.4	83° 28'.9	26'.3
21	315° 53'.9	96° 38'.0	54'.8	177° 26'.3	17'.0	207° 14'.9	14'.4	98° 31'.2	26'.4
22	330° 56'.3	111° 37'.7	55'.8	192° 27'.2	16'.6	222° 17'.0	14'.3	113° 33'.4	26'.5
23	345° 58'.8	126° 37'.3	56'.9	207° 28'.1	16'.2	237° 19'.1	14'.3	128° 35'.6	26'.6
	M.P. 24:00	v -0'.3	d 1'.1	v 0'.9	d 0'.4	v 2'.1	d 0'.0	v 2'.2	d 0'.1

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 17'.9	40° 14'.8 S	181° 31'.9	1° 30'.0 N	8° 37'.4	10'.5	0° 21'.8 S	11'.8	58'.8
Achernar	335° 26'.2	57° 09'.8 S	196° 32'.1	29'.1	23° 06'.9	10'.4	10'.0	11'.8	
Acrux	173° 09'.7	63° 10'.5 S	211° 32'.3	28'.1	37° 36'.3	10'.5	0° 01'.8 N	11'.8	58'.7
Adhara	255° 12'.5	28° 59'.3 S	226° 32'.5	27'.1	52° 05'.8	10'.5	13'.6	11'.8	
Aldebaran	290° 49'.0	16° 32'.1 N	241° 32'.7	26'.2	66° 35'.3	10'.5	25'.4	11'.7	
			256° 33'.0	25'.2	81° 04'.8	10'.6	37'.1	11'.7	
Alioth	166° 21'.1	55° 53'.2 N	271° 33'.2	24'.2	95° 34'.4	10'.6	48'.8	11'.8	
Alkaid	152° 59'.2	49° 14'.9 N	286° 33'.4	23'.3	110° 04'.0	10'.6	1° 00'.6 N	11'.7	58'.6
Alnair	27° 43'.1	46° 53'.5 S	301° 33'.6	22'.3	124° 33'.6	10'.6	12'.3	11'.7	
Alnilam	275° 46'.2	1° 11'.6 S	316° 33'.9	21'.3	139° 03'.2	10'.6	24'.0	11'.6	
Alphard	217° 56'.2	8° 43'.1 S	331° 34'.1	20'.4	153° 32'.8	10'.7	35'.6	11'.7	
			346° 34'.3	19'.4	168° 02'.5	10'.7	47'.3	11'.6	58'.5
Alphecca	126° 11'.1	26° 40'.4 N	1° 34'.5	1° 18'.4 N	182° 32'.2	10'.7	1° 58'.9 N	11'.6	58'.5
Alpheratz	357° 42'.9	29° 10'.1 N	16° 34'.8	17'.4	197° 01'.9	10'.7	2° 10'.5 N	11'.6	
Altair	62° 07'.9	8° 54'.6 N	31° 35'.0	16'.5	211° 31'.6	10'.8	22'.1	11'.6	
Ankaa	353° 15'.1	42° 13'.7 S	46° 35'.2	15'.5	226° 01'.4	10'.7	33'.7	11'.5	58'.4
Antares	112° 26'.1	26° 27'.6 S	61° 35'.4	14'.5	240° 31'.1	10'.8	45'.2	11'.6	
			76° 35'.7	13'.6	255° 00'.9	10'.8	56'.8	11'.5	
Arcturus	145° 55'.8	19° 06'.9 N	91° 35'.9	12'.6	269° 30'.7	10'.8	3° 08'.3 N	11'.4	
Atria	107° 27'.9	69° 03'.2 S	106° 36'.1	11'.6	284° 00'.5	10'.9	19'.7	11'.5	58'.3
Avior	234° 18'.3	59° 33'.1 S	121° 36'.3	10'.7	298° 30'.4	10'.8	31'.2	11'.4	
Bellatrix	278° 31'.8	6° 21'.7 N	136° 36'.5	09'.7	313° 00'.2	10'.9	42'.6	11'.3	
Betelgeuse	271° 01'.1	7° 24'.5 N	151° 36'.8	08'.7	327° 30'.1	10'.9	53'.9	11'.4	58'.2
			166° 37'.0	07'.7	342° 00'.0	10'.9	4° 05'.3 N	11'.3	
Canopus	263° 56'.1	52° 42'.0 S	181° 37'.2	1° 06'.8 N	356° 29'.9	10'.9	4° 16'.6 N	11'.3	58'.2
Capella	280° 34'.1	46° 00'.4 N	196° 37'.4	05'.8	10° 59'.8	10'.9	27'.9	11'.2	
Deneb	49° 31'.0	45° 20'.2 N	211° 37'.7	04'.8	25° 29'.7	10'.9	39'.1	11'.2	58'.1
Denebola	182° 33'.8	14° 29'.8 N	226° 37'.9	03'.9	39° 59'.6	11'.0	50'.3	11'.2	
Diphda	348° 55'.4	17° 54'.5 S	241° 38'.1	02'.9	54° 29'.6	11'.0	5° 01'.5 N	11'.1	
			256° 38'.3	01'.9	68° 59'.6	11'.0	12'.6	11'.1	
Dubhe	193° 52'.2	61° 40'.5 N	271° 38'.6	01'.0	83° 29'.6	10'.9	23'.7	11'.1	58'.0
Elnath	278° 12'.3	28° 36'.9 N	286° 38'.8	1° 00'.0 N	97° 59'.5	11'.1	34'.8	11'.0	
Eltanin	90° 46'.0	51° 29'.7 N	301° 39'.0	59'.0	112° 29'.6	11'.0	45'.8	10'.9	
Enif	33° 46'.7	9° 56'.6 N	316° 39'.2	58'.0	126° 59'.6	11'.0	56'.7	11'.0	57'.9
Fomalhaut	15° 23'.4	29° 32'.8 S	331° 39'.4	57'.1	141° 29'.6	11'.0	6° 07'.7 N	10'.8	
			346° 39'.7	56'.1	155° 59'.6	11'.1	18'.5	10'.9	
Gacrux	172° 01'.2	57° 11'.4 S	1° 39'.9	0° 55'.1 N	170° 29'.7	11'.1	6° 29'.4 N	10'.8	57'.9
Gienah	175° 52'.4	17° 37'.0 S	16° 40'.1	54'.2	184° 59'.8	11'.0	40'.2	10'.7	57'.8
Hadar	148° 48'.1	60° 26'.4 S	31° 40'.3	53'.2	199° 29'.8	11'.1	50'.9	10'.7	
Hamal	328° 00'.2	23° 31'.7 N	46° 40'.6	52'.2	213° 59'.9	11'.1	7° 01'.6 N	10'.7	
Kaus Aust.	83° 43'.5	34° 22'.6 S	61° 40'.8	51'.2	228° 30'.0	11'.1	12'.3	10'.6	57'.7
			76° 41'.0	50'.3	243° 00'.1	11'.1	22'.9	10'.5	
Kochab	137° 20'.9	74° 06'.2 N	91° 41'.2	49'.3	257° 30'.2	11'.1	33'.4	10'.5	
Markab	13° 37'.8	15° 17'.0 N	106° 41'.4	48'.3	272° 00'.3	11'.1	43'.9	10'.5	57'.6
Menkar	314° 14'.6	4° 08'.7 N	121° 41'.7	47'.4	286° 30'.4	11'.2	54'.4	10'.4	
Menkent	148° 07'.6	36° 26'.2 S	136° 41'.9	46'.4	301° 00'.6	11'.1	8° 04'.8 N	10'.3	
Miaplacidus	221° 40'.3	69° 46'.3 S	151° 42'.1	45'.4	315° 30'.7	11'.1	15'.1	10'.3	
			166° 42'.3	44'.5	330° 00'.8	11'.2	25'.4	10'.2	57'.5
Mirfak	308° 39'.8	49° 54'.4 N	181° 42'.6	0° 43'.5 N	344° 31'.0	11'.1	8° 35'.6 N	10'.2	57'.5
Nunki	75° 58'.0	26° 16'.6 S	196° 42'.8	42'.5	359° 01'.1	11'.2	45'.8	10'.1	
Peacock	53° 18'.6	56° 41'.4 S	211° 43'.0	41'.5	13° 31'.3	11'.2	55'.9	10'.1	57'.4
Polaris	317° 22'.3	89° 19'.1 N	226° 43'.2	40'.6	28° 01'.5	11'.1	9° 06'.0 N	10'.0	
Pollux	243° 27'.7	27° 59'.4 N	241° 43'.4	39'.6	42° 31'.6	11'.2	16'.0	9'.9	
			256° 43'.7	38'.6	57° 01'.8	11'.2	25'.9	9'.9	57'.3
Procyon	244° 59'.7	5° 11'.3 N	271° 43'.9	37'.7	71° 32'.0	11'.2	35'.8	9'.8	
Rasalhague	96° 06'.3	12° 33'.4 N	286° 44'.1	36'.7	86° 02'.2	11'.2	45'.6	9'.7	
Regulus	207° 43'.6	11° 54'.0 N	301° 44'.3	35'.7	100° 32'.4	11'.2	55'.3	9'.7	
Rigel	281° 11'.8	8° 11'.1 S	316° 44'.6	34'.7	115° 02'.6	11'.2	10° 05'.0 N	9'.7	57'.2
Rigil Kent	139° 51'.8	60° 53'.5 S	331° 44'.8	33'.8	129° 32'.8	11'.2	14'.7	9'.5	
			346° 45'.0	32'.8	144° 03'.0	11'.2	24'.2	9'.5	
Sabik	102° 12'.4	15° 44'.3 S	1° 45'.2	0° 31'.8 N	158° 33'.2	11'.2	10° 33'.7 N	9'.5	57'.1
Schedar	349° 39'.7	56° 36'.8 N	16° 45'.4	30'.9	173° 03'.4	11'.2	43'.2	9'.3	
Shaula	96° 21'.7	37° 06'.7 S	31° 45'.7	29'.9	187° 33'.6	11'.2	52'.5	9'.3	
Sirius	258° 33'.6	16° 44'.1 S	46° 45'.9	28'.9	202° 03'.8	11'.2	11° 01'.8 N	9'.3	57'.0
Spica	158° 31'.3	11° 13'.9 S	61° 46'.1	27'.9	216° 34'.0	11'.3	11'.1	9'.2	
			76° 46'.3	27'.0	231° 04'.3	11'.2	20'.3	9'.0	
Suhail	222° 52'.6	43° 29'.2 S	91° 46'.6	26'.0	245° 34'.5	11'.2	29'.3	9'.1	
Vega	80° 38'.7	38° 48'.2 N	106° 46'.8	25'.0	260° 04'.7	11'.2	38'.4	8'.9	56'.9
Zuben'ubi	137° 05'.4	16° 05'.8 S	121° 47'.0	24'.0	274° 34'.9	11'.3	47'.3	8'.9	
			136° 47'.2	23'.1	289° 05'.2	11'.2	56'.2	8'.8	
	SHA	Mer.Pass.	151° 47'.4	22'.1	303° 35'.4	11'.2	12° 05'.0 N	8'.8	56'.8
Venus	142° 48'.7	14:33	166° 47'.7	21'.1	318° 05'.6	11'.3	13'.8	8'.7	
Mars	222° 42'.7	09:12							
Jupiter	251° 37'.3	07:16							
Saturn	142° 48'.1	14:30	SD 15'.9	d 1'.0	SD	15'.9	15'.8	15'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21
N 72°	02:46	04:21	05:30	17:25	17:16	17:05
N 70°	03:09	04:30	05:32	17:29	17:26	17:24
68°	03:26	04:38	05:34	17:32	17:35	17:38
66°	03:39	04:44	05:36	17:35	17:42	17:50
64°	03:50	04:49	05:37	17:37	17:48	18:00
62°	03:59	04:54	05:39	17:39	17:53	18:09
60°	04:07	04:58	05:40	17:41	17:58	18:17
N 58°	04:14	05:01	05:41	17:43	18:02	18:23
56°	04:19	05:04	05:41	17:44	18:06	18:29
54°	04:24	05:07	05:42	17:45	18:09	18:34
52°	04:29	05:09	05:43	17:47	18:12	18:39
50°	04:33	05:11	05:43	17:48	18:15	18:43
45°	04:41	05:15	05:45	17:50	18:21	18:53
N 40°	04:47	05:19	05:46	17:52	18:26	19:01
35°	04:52	05:21	05:47	17:54	18:30	19:07
30°	04:55	05:23	05:47	17:55	18:34	19:13
20°	05:01	05:26	05:48	17:58	18:41	19:24
N 10°	05:04	05:28	05:49	18:00	18:47	19:33
0°	05:05	05:29	05:50	18:03	18:52	19:42
S 10°	05:05	05:30	05:51	18:05	18:58	19:50
20°	05:04	05:29	05:51	18:07	19:04	20:00
30°	05:00	05:28	05:52	18:10	19:11	20:10
35°	04:58	05:27	05:52	18:12	19:15	20:17
40°	04:54	05:26	05:53	18:14	19:20	20:24
45°	04:49	05:24	05:53	18:16	19:25	20:32
S 50°	04:43	05:21	05:53	18:19	19:32	20:42
52°	04:40	05:20	05:53	18:20	19:35	20:47
54°	04:37	05:18	05:53	18:21	19:38	20:52
56°	04:33	05:17	05:54	18:23	19:42	20:58
58°	04:28	05:15	05:54	18:24	19:46	21:04
S 60°	04:23	05:12	05:54	18:26	19:50	21:11
S 62°	04:17	05:10	05:54	18:28	19:55	21:20

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 19	Moonset 20	Moonset 21
N 72°	18:14	19:23	20:56	05:45	07:39	09:33
N 70°	18:12	19:14	20:34	05:44	07:31	09:16
68°	18:10	19:06	20:18	05:43	07:24	09:03
66°	18:09	19:00	20:05	05:42	07:18	08:52
64°	18:08	18:55	19:54	05:42	07:14	08:43
62°	18:07	18:51	19:45	05:42	07:10	08:35
60°	18:06	18:47	19:38	05:41	07:06	08:29
N 58°	18:05	18:44	19:31	05:41	07:03	08:23
56°	18:04	18:41	19:26	05:40	07:00	08:18
54°	18:03	18:39	19:21	05:40	06:58	08:13
52°	18:03	18:37	19:17	05:40	06:56	08:09
50°	18:02	18:35	19:13	05:40	06:54	08:05
45°	18:01	18:31	19:05	05:39	06:49	07:57
N 40°	18:00	18:27	18:59	05:39	06:45	07:51
35°	18:00	18:25	18:54	05:38	06:42	07:45
30°	17:59	18:23	18:51	05:38	06:39	07:40
20°	17:58	18:20	18:46	05:37	06:35	07:31
N 10°	17:57	18:18	18:43	05:37	06:30	07:23
0°	17:57	18:17	18:41	05:36	06:26	07:16
S 10°	17:56	18:17	18:41	05:36	06:22	07:09
20°	17:56	18:18	18:43	05:35	06:18	07:01
30°	17:55	18:19	18:47	05:34	06:13	06:52
35°	17:55	18:20	18:50	05:34	06:10	06:47
40°	17:55	18:22	18:53	05:34	06:07	06:42
45°	17:55	18:24	18:58	05:33	06:04	06:35
S 50°	17:55	18:27	19:05	05:32	05:59	06:27
52°	17:54	18:28	19:08	05:32	05:57	06:23
54°	17:54	18:30	19:11	05:32	05:55	06:19
56°	17:54	18:31	19:15	05:31	05:53	06:15
58°	17:54	18:33	19:20	05:31	05:50	06:10
S 60°	17:54	18:36	19:25	05:31	05:47	06:05
S 62°	17:54	18:38	19:32	05:30	05:44	05:59

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
19	6 07	6 18	11:54	24:14	11:50	14d Full
20	6 28	6 39	11:53	00:14	12:39	15d 99%
21	6 50	7 00	11:53	01:04	13:29	16d 95%

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2013 September 22, 23, 24 (Sun, Mon, Tue)

GMT	ARIES	VENUS -4.1		MARS +1.6		JUPITER -2.1		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
22 Sunday 00	1° 01'.3	141° 37'.0	16° 57'.9 S	222° 29'.0	17° 15'.7 N	252° 21'.2	22° 14'.2 N	143° 37'.8	12° 26'.7 S
01	16° 03'.7	156° 36'.7	58'.9	237° 29'.9	15'.3	267° 23'.3	14'.2	158° 40'.0	26'.8
02	31° 06'.2	171° 36'.4	17° 00'.0 S	252° 30'.8	14'.8	282° 25'.4	14'.2	173° 42'.3	26'.8
03	46° 08'.6	186° 36'.1	01'.0	267° 31'.8	14'.4	297° 27'.5	14'.1	188° 44'.5	26'.9
04	61° 11'.1	201° 35'.8	02'.0	282° 32'.7	14'.0	312° 29'.6	14'.1	203° 46'.7	27'.0
05	76° 13'.6	216° 35'.5	03'.1	297° 33'.6	13'.5	327° 31'.7	14'.0	218° 48'.9	27'.1
06	91° 16'.0	231° 35'.2	04'.1	312° 34'.5	13'.1	342° 33'.8	14'.0	233° 51'.1	27'.2
07	106° 18'.5	246° 34'.8	05'.1	327° 35'.4	12'.6	357° 35'.9	14'.0	248° 53'.4	27'.3
08	121° 21'.0	261° 34'.5	06'.2	342° 36'.3	12'.2	12° 38'.1	13'.9	263° 55'.6	27'.4
09	136° 23'.4	276° 34'.2	07'.2	357° 37'.2	11'.7	27° 40'.2	13'.9	278° 57'.8	27'.4
10	151° 25'.9	291° 33'.9	08'.2	12° 38'.1	11'.3	42° 42'.3	13'.9	294° 00'.0	27'.5
11	166° 28'.4	306° 33'.6	09'.3	27° 39'.0	10'.9	57° 44'.4	13'.8	309° 02'.3	27'.6
12	181° 30'.8	321° 33'.3	17° 10'.3 S	42° 39'.9	17° 10'.4 N	72° 46'.5	22° 13'.8 N	324° 04'.5	12° 27'.7 S
13	196° 33'.3	336° 33'.0	11'.3	57° 40'.9	10'.0	87° 48'.6	13'.7	339° 06'.7	27'.8
14	211° 35'.7	351° 32'.6	12'.3	72° 41'.8	09'.5	102° 50'.7	13'.7	354° 08'.9	27'.9
15	226° 38'.2	6° 32'.3	13'.4	87° 42'.7	09'.1	117° 52'.8	13'.7	9° 11'.1	28'.0
16	241° 40'.7	21° 32'.0	14'.4	102° 43'.6	08'.6	132° 54'.9	13'.6	24° 13'.3	28'.0
17	256° 43'.1	36° 31'.7	15'.4	117° 44'.5	08'.2	147° 57'.1	13'.6	39° 15'.6	28'.1
18	271° 45'.6	51° 31'.4	16'.5	132° 45'.4	07'.8	162° 59'.2	13'.6	54° 17'.8	28'.2
19	286° 48'.1	66° 31'.1	17'.5	147° 46'.3	07'.3	178° 01'.3	13'.5	69° 20'.0	28'.3
20	301° 50'.5	81° 30'.7	18'.5	162° 47'.2	06'.9	193° 03'.4	13'.5	84° 22'.2	28'.4
21	316° 53'.0	96° 30'.4	19'.5	177° 48'.1	06'.4	208° 05'.5	13'.4	99° 24'.4	28'.5
22	331° 55'.5	111° 30'.1	20'.5	192° 49'.1	06'.0	223° 07'.6	13'.4	114° 26'.7	28'.6
23	346° 57'.9	126° 29'.8	21'.6	207° 50'.0	05'.5	238° 09'.7	13'.4	129° 28'.9	28'.7
23 Monday 00	2° 00'.4	141° 29'.5	17° 22'.6 S	222° 50'.9	17° 05'.1 N	253° 11'.8	22° 13'.3 N	144° 31'.1	12° 28'.7 S
01	17° 02'.9	156° 29'.1	23'.6	237° 51'.8	04'.7	268° 14'.0	13'.3	159° 33'.3	28'.8
02	32° 05'.3	171° 28'.8	24'.6	252° 52'.7	04'.2	283° 16'.1	13'.2	174° 35'.5	28'.9
03	47° 07'.8	186° 28'.5	25'.7	267° 53'.6	03'.8	298° 18'.2	13'.2	189° 37'.8	29'.0
04	62° 10'.2	201° 28'.2	26'.7	282° 54'.5	03'.3	313° 20'.3	13'.2	204° 40'.0	29'.1
05	77° 12'.7	216° 27'.9	27'.7	297° 55'.5	02'.9	328° 22'.4	13'.1	219° 42'.2	29'.2
06	92° 15'.2	231° 27'.5	28'.7	312° 56'.4	02'.4	343° 24'.5	13'.1	234° 44'.4	29'.3
07	107° 17'.6	246° 27'.2	29'.7	327° 57'.3	02'.0	358° 26'.6	13'.1	249° 46'.6	29'.3
08	122° 20'.1	261° 26'.9	30'.7	342° 58'.2	01'.5	13° 28'.8	13'.0	264° 48'.8	29'.4
09	137° 22'.6	276° 26'.6	31'.8	357° 59'.1	01'.1	28° 30'.9	13'.0	279° 51'.1	29'.5
10	152° 25'.0	291° 26'.3	32'.8	13° 00'.0	00'.7	43° 33'.0	12'.9	294° 53'.3	29'.6
11	167° 27'.5	306° 25'.9	33'.8	28° 00'.9	00'.2	58° 35'.1	12'.9	309° 55'.5	29'.7
12	182° 30'.0	321° 25'.6	17° 34'.8 S	43° 01'.9	16° 59'.8 N	73° 37'.2	22° 12'.9 N	324° 57'.7	12° 29'.8 S
13	197° 32'.4	336° 25'.3	35'.8	58° 02'.8	59'.3	88° 39'.3	12'.8	339° 59'.9	29'.9
14	212° 34'.9	351° 25'.0	36'.8	73° 03'.7	58'.9	103° 41'.5	12'.8	355° 02'.2	30'.0
15	227° 37'.3	6° 24'.6	37'.8	88° 04'.6	58'.4	118° 43'.6	12'.8	10° 04'.4	30'.0
16	242° 39'.8	21° 24'.3	38'.8	103° 05'.5	58'.0	133° 45'.7	12'.7	25° 06'.6	30'.1
17	257° 42'.3	36° 24'.0	39'.9	118° 06'.4	57'.5	148° 47'.8	12'.7	40° 08'.8	30'.2
18	272° 44'.7	51° 23'.7	40'.9	133° 07'.4	57'.1	163° 49'.9	12'.6	55° 11'.0	30'.3
19	287° 47'.2	66° 23'.3	41'.9	148° 08'.3	56'.6	178° 52'.0	12'.6	70° 13'.2	30'.4
20	302° 49'.7	81° 23'.0	42'.9	163° 09'.2	56'.2	193° 54'.2	12'.6	85° 15'.5	30'.5
21	317° 52'.1	96° 22'.7	43'.9	178° 10'.1	55'.7	208° 56'.3	12'.5	100° 17'.7	30'.6
22	332° 54'.6	111° 22'.4	44'.9	193° 11'.0	55'.3	223° 58'.4	12'.5	115° 19'.9	30'.6
23	347° 57'.1	126° 22'.0	45'.9	208° 11'.9	54'.8	239° 00'.5	12'.5	130° 22'.1	30'.7
24 Tuesday 00	2° 59'.5	141° 21'.7	17° 46'.9 S	223° 12'.9	16° 54'.4 N	254° 02'.6	22° 12'.4 N	145° 24'.3	12° 30'.8 S
01	18° 02'.0	156° 21'.4	47'.9	238° 13'.8	54'.0	269° 04'.8	12'.4	160° 26'.5	30'.9
02	33° 04'.5	171° 21'.1	48'.9	253° 14'.7	53'.5	284° 06'.9	12'.3	175° 28'.8	31'.0
03	48° 06'.9	186° 20'.7	49'.9	268° 15'.6	53'.1	299° 09'.0	12'.3	190° 31'.0	31'.1
04	63° 09'.4	201° 20'.4	50'.9	283° 16'.5	52'.6	314° 11'.1	12'.3	205° 33'.2	31'.2
05	78° 11'.8	216° 20'.1	51'.9	298° 17'.5	52'.2	329° 13'.2	12'.2	220° 35'.4	31'.3
06	93° 14'.3	231° 19'.8	52'.9	313° 18'.4	51'.7	344° 15'.4	12'.2	235° 37'.6	31'.3
07	108° 16'.8	246° 19'.4	53'.9	328° 19'.3	51'.3	359° 17'.5	12'.2	250° 39'.8	31'.4
08	123° 19'.2	261° 19'.1	54'.9	343° 20'.2	50'.8	14° 19'.6	12'.1	265° 42'.1	31'.5
09	138° 21'.7	276° 18'.8	55'.9	358° 21'.1	50'.4	29° 21'.7	12'.1	280° 44'.3	31'.6
10	153° 24'.2	291° 18'.4	56'.9	13° 22'.1	49'.9	44° 23'.9	12'.0	295° 46'.5	31'.7
11	168° 26'.6	306° 18'.1	57'.9	28° 23'.0	49'.5	59° 26'.0	12'.0	310° 48'.7	31'.8
12	183° 29'.1	321° 17'.8	17° 58'.9 S	43° 23'.9	16° 49'.0 N	74° 28'.1	22° 12'.0 N	325° 50'.9	12° 31'.9 S
13	198° 31'.6	336° 17'.5	59'.9	58° 24'.8	48'.6	89° 30'.2	11'.9	340° 53'.1	31'.9
14	213° 34'.0	351° 17'.1	18° 00'.9 S	73° 25'.7	48'.1	104° 32'.3	11'.9	355° 55'.4	32'.0
15	228° 36'.5	6° 16'.8	01'.9	88° 26'.7	47'.7	119° 34'.5	11'.9	10° 57'.6	32'.1
16	243° 39'.0	21° 16'.5	02'.9	103° 27'.6	47'.2	134° 36'.6	11'.8	25° 59'.8	32'.2
17	258° 41'.4	36° 16'.1	03'.9	118° 28'.5	46'.8	149° 38'.7	11'.8	41° 02'.0	32'.3
18	273° 43'.9	51° 15'.8	04'.9	133° 29'.4	46'.3	164° 40'.8	11'.7	56° 04'.2	32'.4
19	288° 46'.3	66° 15'.5	05'.9	148° 30'.3	45'.9	179° 43'.0	11'.7	71° 06'.4	32'.5
20	303° 48'.8	81° 15'.1	06'.9	163° 31'.3	45'.4	194° 45'.1	11'.7	86° 08'.6	32'.6
21	318° 51'.3	96° 14'.8	07'.9	178° 32'.2	45'.0	209° 47'.2	11'.6	101° 10'.9	32'.6
22	333° 53'.7	111° 14'.5	08'.9	193° 33'.1	44'.5	224° 49'.3	11'.6	116° 13'.1	32'.7
23	348° 56'.2	126° 14'.1	09'.9	208° 34'.0	44'.1	239° 51'.5	11'.6	131° 15'.3	32'.8
	M.P. 23:48	v -0'.3	d 1'.0	v 0'.9	d 0'.4	v 2'.1	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.9	40° 14'.8 S
Achernar	335° 26'.2	57° 09'.8 S
Acrux	173° 09'.7	63° 10'.5 S
Adhara	255° 12'.5	28° 59'.3 S
Aldebaran	290° 49'.0	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.2 N
Alkaid	152° 59'.2	49° 14'.9 N
Alnair	27° 43'.1	46° 53'.5 S
Alnilam	275° 46'.1	1° 11'.6 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 07'.9	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.7 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.9	69° 03'.2 S
Avior	234° 18'.3	59° 33'.1 S
Bellatrix	278° 31'.7	6° 21'.7 N
Betelgeuse	271° 01'.1	7° 24'.5 N
Canopus	263° 56'.1	52° 42'.0 S
Capella	280° 34'.1	46° 00'.4 N
Deneb	49° 31'.0	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.5 N
Elnath	278° 12'.3	28° 36'.9 N
Eltanin	90° 46'.1	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.4 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.4 S
Hamal	328° 00'.2	23° 31'.7 N
Kaus Aust.	83° 43'.5	34° 22'.6 S
Kochab	137° 21'.0	74° 06'.2 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.6	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.2 S
Miaplacidus	221° 40'.2	69° 46'.3 S
Mirfak	308° 39'.7	49° 54'.4 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.6	56° 41'.4 S
Polaris	317° 21'.1	89° 19'.1 N
Pollux	243° 27'.7	27° 59'.4 N
Procyon	244° 59'.7	5° 11'.3 N
Rasalhague	96° 06'.3	12° 33'.4 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 11'.8	8° 11'.1 S
Rigil Kent	139° 51'.9	60° 53'.5 S
Sabik	102° 12'.4	15° 44'.3 S
Schedar	349° 39'.7	56° 36'.8 N
Shaula	96° 21'.7	37° 06'.7 S
Sirius	258° 33'.6	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.6	43° 29'.2 S
Vega	80° 38'.8	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	139° 29'.1	14:34
Mars	220° 50'.5	09:08
Jupiter	251° 11'.5	07:06
Saturn	142° 30'.7	14:20

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
181° 47'.9	0° 20'.2 N	332° 35'.9	11'.2	12° 22'.5 N	8'.6	56'.8
196° 48'.1	19'.2	347° 06'.1	11'.2	31'.1	8'.5	56'.7
211° 48'.3	18'.2	1° 36'.3	11'.3	39'.6	8'.4	
226° 48'.5	17'.2	16° 06'.6	11'.2	48'.0	8'.4	
241° 48'.8	16'.3	30° 36'.8	11'.2	56'.4	8'.3	56'.6
256° 49'.0	15'.3	45° 07'.0	11'.3	13° 04'.7 N	8'.2	
271° 49'.2	14'.3	59° 37'.3	11'.2	12'.9	8'.2	
286° 49'.4	13'.4	74° 07'.5	11'.3	21'.1	8'.0	
301° 49'.6	12'.4	88° 37'.8	11'.2	29'.1	8'.0	56'.5
316° 49'.9	11'.4	103° 08'.0	11'.2	37'.1	7'.9	
331° 50'.1	10'.4	117° 38'.2	11'.3	45'.0	7'.9	
346° 50'.3	09'.5	132° 08'.5	11'.2	52'.9	7'.7	56'.4
1° 50'.5	0° 08'.5 N	146° 38'.7	11'.3	14° 00'.6 N	7'.7	56'.4
16° 50'.8	07'.5	161° 09'.0	11'.2	08'.3	7'.6	
31° 51'.0	06'.5	175° 39'.2	11'.2	15'.9	7'.5	
46° 51'.2	05'.6	190° 09'.4	11'.3	23'.4	7'.4	56'.3
61° 51'.4	04'.6	204° 39'.7	11'.2	30'.8	7'.4	
76° 51'.6	03'.6	219° 09'.9	11'.3	38'.2	7'.3	
91° 51'.9	02'.7	233° 40'.2	11'.2	45'.5	7'.1	56'.2
106° 52'.1	01'.7	248° 10'.4	11'.3	52'.6	7'.1	
121° 52'.3	00'.7	262° 40'.7	11'.2	59'.7	7'.1	
136° 52'.5	0° 00'.3 S	277° 10'.9	11'.2	15° 06'.8 N	6'.9	56'.1
151° 52'.7	01'.2	291° 41'.1	11'.3	13'.7	6'.8	
166° 53'.0	02'.2	306° 11'.4	11'.2	20'.5	6'.8	
181° 53'.2	0° 03'.2 S	320° 41'.6	11'.3	15° 27'.3 N	6'.7	56'.1
196° 53'.4	04'.2	335° 11'.9	11'.2	34'.0	6'.6	56'.0
211° 53'.6	05'.1	349° 42'.1	11'.3	40'.6	6'.5	
226° 53'.8	06'.1	4° 12'.4	11'.2	47'.1	6'.4	
241° 54'.1	07'.1	18° 42'.6	11'.3	53'.5	6'.3	55'.9
256° 54'.3	08'.0	33° 12'.9	11'.2	59'.8	6'.3	
271° 54'.5	09'.0	47° 43'.1	11'.3	16° 06'.1 N	6'.2	
286° 54'.7	10'.0	62° 13'.4	11'.2	12'.3	6'.0	
301° 54'.9	11'.0	76° 43'.6	11'.3	18'.3	6'.0	55'.8
316° 55'.2	11'.9	91° 13'.9	11'.2	24'.3	5'.9	
331° 55'.4	12'.9	105° 44'.1	11'.3	30'.2	5'.8	
346° 55'.6	13'.9	120° 14'.4	11'.2	36'.0	5'.7	
1° 55'.8	0° 14'.9 S	134° 44'.6	11'.3	16° 41'.7 N	5'.7	55'.7
16° 56'.0	15'.8	149° 14'.9	11'.3	47'.4	5'.5	
31° 56'.2	16'.8	163° 45'.2	11'.2	52'.9	5'.5	
46° 56'.5	17'.8	178° 15'.4	11'.3	58'.4	5'.3	55'.6
61° 56'.7	18'.8	192° 45'.7	11'.3	17° 03'.7 N	5'.3	
76° 56'.9	19'.7	207° 16'.0	11'.2	09'.0	5'.2	
91° 57'.1	20'.7	221° 46'.2	11'.3	14'.2	5'.1	
106° 57'.3	21'.7	236° 16'.5	11'.3	19'.3	5'.0	55'.5
121° 57'.6	22'.6	250° 46'.8	11'.3	24'.3	4'.9	
136° 57'.8	23'.6	265° 17'.1	11'.2	29'.2	4'.8	
151° 58'.0	24'.6	279° 47'.3	11'.3	34'.0	4'.7	
166° 58'.2	25'.6	294° 17'.6	11'.3	38'.7	4'.7	55'.4
181° 58'.4	0° 26'.5 S	308° 47'.9	11'.3	17° 43'.4 N	4'.5	55'.4
196° 58'.7	27'.5	323° 18'.2	11'.3	47'.9	4'.4	
211° 58'.9	28'.5	337° 48'.5	11'.3	52'.3	4'.4	
226° 59'.1	29'.5	352° 18'.8	11'.3	56'.7	4'.3	55'.3
241° 59'.3	30'.4	6° 49'.1	11'.3	18° 01'.0 N	4'.1	
256° 59'.5	31'.4	21° 19'.4	11'.3	05'.1	4'.1	
271° 59'.7	32'.4	35° 49'.7	11'.3	09'.2	4'.0	
287° 00'.0	33'.4	50° 20'.0	11'.4	13'.2	3'.9	
302° 00'.2	34'.3	64° 50'.4	11'.3	17'.1	3'.8	55'.2
317° 00'.4	35'.3	79° 20'.7	11'.3	20'.9	3'.7	
332° 00'.6	36'.3	93° 51'.0	11'.4	24'.6	3'.6	
347° 00'.8	37'.2	108° 21'.4	11'.3	28'.2	3'.5	
2° 01'.1	0° 38'.2 S	122° 51'.7	11'.4	18° 31'.7 N	3'.5	55'.1
17° 01'.3	39'.2	137° 22'.1	11'.3	35'.2	3'.3	
32° 01'.5	40'.2	151° 52'.4	11'.4	38'.5	3'.2	
47° 01'.7	41'.1	166° 22'.8	11'.4	41'.7	3'.2	
62° 01'.9	42'.1	180° 53'.2	11'.4	44'.9	3'.0	
77° 02'.1	43'.1	195° 23'.6	11'.3	47'.9	3'.0	55'.0
92° 02'.4	44'.1	209° 53'.9	11'.4	50'.9	2'.9	
107° 02'.6	45'.0	224° 24'.3	11'.4	53'.8	2'.7	
122° 02'.8	46'.0	238° 54'.7	11'.5	56'.5	2'.7	
137° 03'.0	47'.0	253° 25'.2	11'.4	59'.2	2'.6	54'.9
152° 03'.2	48'.0	267° 55'.6	11'.4	19° 01'.8 N	2'.5	
167° 03'.4	48'.9	282° 26'.0	11'.4	04'.3	2'.4	
SD 15'.9	d 1'.0	SD 15'.4		15'.2	15'.0	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 22	Moonrise 23	Moonrise 24
N 72°	03:05	04:35	05:43	16:52	16:29	-
N 70°	03:24	04:43	05:44	17:22	17:21	17:25
68°	03:39	04:49	05:45	17:44	17:54	18:12
66°	03:51	04:54	05:45	18:02	18:18	18:43
64°	04:00	04:58	05:46	18:16	18:37	19:06
62°	04:08	05:02	05:46	18:28	18:52	19:24
60°	04:15	05:05	05:47	18:38	19:05	19:39
N 58°	04:21	05:08	05:47	18:47	19:16	19:52
56°	04:26	05:10	05:47	18:55	19:26	20:03
54°	04:30	05:12	05:48	19:02	19:35	20:13
52°	04:34	05:14	05:48	19:09	19:43	20:21
50°	04:38	05:16	05:48	19:15	19:50	20:29
45°	04:45	05:19	05:48	19:27	20:05	20:46
N 40°	04:50	05:21	05:49	19:37	20:17	21:00
35°	04:54	05:23	05:49	19:46	20:28	21:11
30°	04:57	05:25	05:49	19:54	20:37	21:22
20°	05:01	05:27	05:49	20:08	20:53	21:39
N 10°	05:04	05:28	05:49	20:20	21:07	21:55
0°	05:04	05:28	05:49	20:31	21:20	22:09
S 10°	05:04	05:28	05:49	20:42	21:33	22:23
20°	05:01	05:27	05:49	20:54	21:47	22:39
30°	04:57	05:24	05:48	21:08	22:04	22:57
35°	04:53	05:23	05:48	21:16	22:13	23:07
40°	04:49	05:21	05:48	21:25	22:24	23:19
45°	04:43	05:18	05:47	21:36	22:37	23:33
S 50°	04:36	05:14	05:46	21:49	22:52	23:50
52°	04:33	05:13	05:46	21:55	23:00	23:58
54°	04:29	05:11	05:46	22:02	23:08	24:07
56°	04:24	05:08	05:46	22:10	23:17	24:17
58°	04:19	05:06	05:45	22:18	23:27	24:29
S 60°	04:13	05:03	05:45	22:28	23:39	24:42
S 62°	04:06	05:00	05:44	22:40	23:53	24:58

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 22	Moonset 23	Moonset 24
N 72°	17:59	19:07	20:35	11:29	13:35	-
N 70°	17:58	18:59	20:17	11:01	12:44	14:22
68°	17:58	18:53	20:03	10:39	12:12	13:36
66°	17:57	18:48	19:51	10:23	11:48	13:05
64°	17:57	18:44	19:42	10:09	11:30	12:43
62°	17:57	18:41	19:34	09:58	11:15	12:25
60°	17:56	18:38	19:28	09:48	11:02	12:10
N 58°	17:56	18:35	19:22	09:40	10:52	11:57
56°	17:56	18:33	19:17	09:32	10:42	11:46
54°	17:56	18:31	19:13	09:26	10:34	11:37
52°	17:56	18:29	19:09	09:20	10:27	11:28
50°	17:56	18:28	19:06	09:14	10:20	11:20
45°	17:56	18:25	18:59	09:03	10:06	11:04
N 40°	17:55	18:22	18:54	08:53	09:54	10:51
35°	17:55	18:21	18:50	08:45	09:44	10:39
30°	17:55	18:19	18:47	08:38	09:35	10:29
20°	17:55	18:17	18:43	08:26	09:20	10:12
N 10°	17:55	18:16	18:41	08:15	09:07	09:58
0°	17:56	18:16	18:40	08:05	08:54	09:44
S 10°	17:56	18:17	18:41	07:55	08:42	09:30
20°	17:56	18:18	18:44	07:44	08:29	09:15
30°	17:57	18:21	18:49	07:32	08:14	08:58
35°	17:57	18:23	18:52	07:25	08:05	08:48
40°	17:58	18:25	18:56	07:17	07:56	08:37
45°	17:58	18:28	19:02	07:08	07:44	08:23
S 50°	17:59	18:31	19:10	06:57	07:30	08:07
52°	17:59	18:33	19:13	06:52	07:23	08:00
54°	18:00	18:35	19:17	06:46	07:16	07:51
56°	18:00	18:37	19:22	06:40	07:08	07:42
58°	18:01	18:40	19:27	06:33	06:59	07:31
S 60°	18:01	18:43	19:33	06:25	06:49	07:19
S 62°	18:02	18:46	19:40	06:16	06:37	07:05

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
22	7 11	7 22	11:53	01:53	14:18	17d 90%
23	7 32	7 43	11:52	02:43	15:07	18d 83%
24	7 53	8 04	11:52	03:32	15:56	19d 75%

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2013 September 25, 26, 27 (Wed, Thur, Fri)

GMT	ARIES	VENUS -4.1		MARS +1.6		JUPITER -2.2		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
25 Wednesday 00	3° 58'.7	141° 13'.8	18° 10'.8 S	223° 35'.0	16° 43'.6 N	254° 53'.6	22° 11'.5 N	146° 17'.5	12° 32'.9 S
01	19° 01'.1	156° 13'.5	11'.8	238° 35'.9	43'.2	269° 55'.7	11'.5	161° 19'.7	33'.0
02	34° 03'.6	171° 13'.1	12'.8	253° 36'.8	42'.7	284° 57'.8	11'.5	176° 21'.9	33'.1
03	49° 06'.1	186° 12'.8	13'.8	268° 37'.7	42'.3	300° 00'.0	11'.4	191° 24'.2	33'.2
04	64° 08'.5	201° 12'.5	14'.8	283° 38'.6	41'.8	315° 02'.1	11'.4	206° 26'.4	33'.3
05	79° 11'.0	216° 12'.1	15'.8	298° 39'.6	41'.4	330° 04'.2	11'.3	221° 28'.6	33'.3
06	94° 13'.4	231° 11'.8	16'.8	313° 40'.5	40'.9	345° 06'.4	11'.3	236° 30'.8	33'.4
07	109° 15'.9	246° 11'.5	17'.7	328° 41'.4	40'.4	0° 08'.5	11'.3	251° 33'.0	33'.5
08	124° 18'.4	261° 11'.1	18'.7	343° 42'.3	40'.0	15° 10'.6	11'.2	266° 35'.2	33'.6
09	139° 20'.8	276° 10'.8	19'.7	358° 43'.3	39'.5	30° 12'.7	11'.2	281° 37'.4	33'.7
10	154° 23'.3	291° 10'.4	20'.7	13° 44'.2	39'.1	45° 14'.9	11'.2	296° 39'.7	33'.8
11	169° 25'.8	306° 10'.1	21'.7	28° 45'.1	38'.6	60° 17'.0	11'.1	311° 41'.9	33'.9
12	184° 28'.2	321° 09'.8	18° 22'.7 S	43° 46'.0	16° 38'.2 N	75° 19'.1	22° 11'.1 N	326° 44'.1	12° 34'.0 S
13	199° 30'.7	336° 09'.4	23'.6	58° 47'.0	37'.7	90° 21'.3	11'.0	341° 46'.3	34'.0
14	214° 33'.2	351° 09'.1	24'.6	73° 47'.9	37'.3	105° 23'.4	11'.0	356° 48'.5	34'.1
15	229° 35'.6	6° 08'.8	25'.6	88° 48'.8	36'.8	120° 25'.5	11'.0	11° 50'.7	34'.2
16	244° 38'.1	21° 08'.4	26'.6	103° 49'.7	36'.4	135° 27'.6	10'.9	26° 52'.9	34'.3
17	259° 40'.6	36° 08'.1	27'.6	118° 50'.7	35'.9	150° 29'.8	10'.9	41° 55'.1	34'.4
18	274° 43'.0	51° 07'.7	28'.5	133° 51'.6	35'.5	165° 31'.9	10'.9	56° 57'.4	34'.5
19	289° 45'.5	66° 07'.4	29'.5	148° 52'.5	35'.0	180° 34'.0	10'.8	71° 59'.6	34'.6
20	304° 47'.9	81° 07'.1	30'.5	163° 53'.5	34'.6	195° 36'.2	10'.8	87° 01'.8	34'.6
21	319° 50'.4	96° 06'.7	31'.5	178° 54'.4	34'.1	210° 38'.3	10'.8	102° 04'.0	34'.7
22	334° 52'.9	111° 06'.4	32'.4	193° 55'.3	33'.6	225° 40'.4	10'.7	117° 06'.2	34'.8
23	349° 55'.3	126° 06'.0	33'.4	208° 56'.2	33'.2	240° 42'.6	10'.7	132° 08'.4	34'.9
26 Thursday 00	4° 57'.8	141° 05'.7	18° 34'.4 S	223° 57'.2	16° 32'.7 N	255° 44'.7	22° 10'.6 N	147° 10'.6	12° 35'.0 S
01	20° 00'.3	156° 05'.4	35'.3	238° 58'.1	32'.3	270° 46'.8	10'.6	162° 12'.9	35'.1
02	35° 02'.7	171° 05'.0	36'.3	253° 59'.0	31'.8	285° 49'.0	10'.6	177° 15'.1	35'.2
03	50° 05'.2	186° 04'.7	37'.3	269° 00'.0	31'.4	300° 51'.1	10'.5	192° 17'.3	35'.3
04	65° 07'.7	201° 04'.3	38'.3	284° 00'.9	30'.9	315° 53'.2	10'.5	207° 19'.5	35'.4
05	80° 10'.1	216° 04'.0	39'.2	299° 01'.8	30'.5	330° 55'.4	10'.5	222° 21'.7	35'.4
06	95° 12'.6	231° 03'.7	40'.2	314° 02'.7	30'.0	345° 57'.5	10'.4	237° 23'.9	35'.5
07	110° 15'.1	246° 03'.3	41'.2	329° 03'.7	29'.5	0° 59'.6	10'.4	252° 26'.1	35'.6
08	125° 17'.5	261° 03'.0	42'.1	344° 04'.6	29'.1	16° 01'.8	10'.4	267° 28'.3	35'.7
09	140° 20'.0	276° 02'.6	43'.1	359° 05'.5	28'.6	31° 03'.9	10'.3	282° 30'.6	35'.8
10	155° 22'.4	291° 02'.3	44'.1	14° 06'.5	28'.2	46° 06'.0	10'.3	297° 32'.8	35'.9
11	170° 24'.9	306° 01'.9	45'.0	29° 07'.4	27'.7	61° 08'.2	10'.2	312° 35'.0	36'.0
12	185° 27'.4	321° 01'.6	18° 46'.0 S	44° 08'.3	16° 27'.3 N	76° 10'.3	22° 10'.2 N	327° 37'.2	12° 36'.1 S
13	200° 29'.8	336° 01'.2	46'.9	59° 09'.2	26'.8	91° 12'.4	10'.2	342° 39'.4	36'.1
14	215° 32'.3	351° 00'.9	47'.9	74° 10'.2	26'.4	106° 14'.6	10'.1	357° 41'.6	36'.2
15	230° 34'.8	6° 00'.6	48'.9	89° 11'.1	25'.9	121° 16'.7	10'.1	12° 43'.8	36'.3
16	245° 37'.2	21° 00'.2	49'.8	104° 12'.0	25'.4	136° 18'.8	10'.1	27° 46'.0	36'.4
17	260° 39'.7	35° 59'.9	50'.8	119° 13'.0	25'.0	151° 21'.0	10'.0	42° 48'.2	36'.5
18	275° 42'.2	50° 59'.5	51'.8	134° 13'.9	24'.5	166° 23'.1	10'.0	57° 50'.5	36'.6
19	290° 44'.6	65° 59'.2	52'.7	149° 14'.8	24'.1	181° 25'.3	10'.0	72° 52'.7	36'.7
20	305° 47'.1	80° 58'.8	53'.7	164° 15'.8	23'.6	196° 27'.4	09'.9	87° 54'.9	36'.8
21	320° 49'.6	95° 58'.5	54'.6	179° 16'.7	23'.1	211° 29'.5	09'.9	102° 57'.1	36'.8
22	335° 52'.0	110° 58'.1	55'.6	194° 17'.6	22'.7	226° 31'.7	09'.8	117° 59'.3	36'.9
23	350° 54'.5	125° 57'.8	56'.5	209° 18'.6	22'.2	241° 33'.8	09'.8	133° 01'.5	37'.0
27 Friday 00	5° 56'.9	140° 57'.4	18° 57'.5 S	224° 19'.5	16° 21'.8 N	256° 35'.9	22° 09'.8 N	148° 03'.7	12° 37'.1 S
01	20° 59'.4	155° 57'.1	58'.5	239° 20'.4	21'.3	271° 38'.1	09'.7	163° 05'.9	37'.2
02	36° 01'.9	170° 56'.7	59'.4	254° 21'.4	20'.9	286° 40'.2	09'.7	178° 08'.1	37'.3
03	51° 04'.3	185° 56'.4	19° 00'.4 S	269° 22'.3	20'.4	301° 42'.4	09'.7	193° 10'.4	37'.4
04	66° 06'.8	200° 56'.0	01'.3	284° 23'.2	19'.9	316° 44'.5	09'.6	208° 12'.6	37'.5
05	81° 09'.3	215° 55'.7	02'.3	299° 24'.2	19'.5	331° 46'.6	09'.6	223° 14'.8	37'.5
06	96° 11'.7	230° 55'.3	03'.2	314° 25'.1	19'.0	346° 48'.8	09'.6	238° 17'.0	37'.6
07	111° 14'.2	245° 55'.0	04'.2	329° 26'.0	18'.6	1° 50'.9	09'.5	253° 19'.2	37'.7
08	126° 16'.7	260° 54'.6	05'.1	344° 27'.0	18'.1	16° 53'.1	09'.5	268° 21'.4	37'.8
09	141° 19'.1	275° 54'.3	06'.1	359° 27'.9	17'.6	31° 55'.2	09'.5	283° 23'.6	37'.9
10	156° 21'.6	290° 53'.9	07'.0	14° 28'.8	17'.2	46° 57'.3	09'.4	298° 25'.8	38'.0
11	171° 24'.0	305° 53'.6	08'.0	29° 29'.8	16'.7	61° 59'.5	09'.4	313° 28'.0	38'.1
12	186° 26'.5	320° 53'.2	19° 08'.9 S	44° 30'.7	16° 16'.3 N	77° 01'.6	22° 09'.3 N	328° 30'.2	12° 38'.2 S
13	201° 29'.0	335° 52'.9	09'.8	59° 31'.6	15'.8	92° 03'.8	09'.3	343° 32'.5	38'.2
14	216° 31'.4	350° 52'.5	10'.8	74° 32'.6	15'.3	107° 05'.9	09'.3	358° 34'.7	38'.3
15	231° 33'.9	5° 52'.2	11'.7	89° 33'.5	14'.9	122° 08'.1	09'.2	13° 36'.9	38'.4
16	246° 36'.4	20° 51'.8	12'.7	104° 34'.4	14'.4	137° 10'.2	09'.2	28° 39'.1	38'.5
17	261° 38'.8	35° 51'.5	13'.6	119° 35'.4	14'.0	152° 12'.3	09'.2	43° 41'.3	38'.6
18	276° 41'.3	50° 51'.1	14'.6	134° 36'.3	13'.5	167° 14'.5	09'.1	58° 43'.5	38'.7
19	291° 43'.8	65° 50'.8	15'.5	149° 37'.3	13'.0	182° 16'.6	09'.1	73° 45'.7	38'.8
20	306° 46'.2	80° 50'.4	16'.4	164° 38'.2	12'.6	197° 18'.8	09'.1	88° 47'.9	38'.9
21	321° 48'.7	95° 50'.1	17'.4	179° 39'.1	12'.1	212° 20'.9	09'.0	103° 50'.1	39'.0
22	336° 51'.2	110° 49'.7	18'.3	194° 40'.1	11'.7	227° 23'.1	09'.0	118° 52'.3	39'.0
23	351° 53'.6	125° 49'.3	19'.3	209° 41'.0	11'.2	242° 25'.2	09'.0	133° 54'.6	39'.1
	M.P. 23:36	v -0'.3	d 1'.0	v 0'.9	d 0'.5	v 2'.1	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.9	40° 14'.8 S
Achernar	335° 26'.1	57° 09'.9 S
Acrux	173° 09'.7	63° 10'.5 S
Adhara	255° 12'.4	28° 59'.3 S
Aldebaran	290° 49'.0	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.2 N
Alkaid	152° 59'.2	49° 14'.9 N
Alnair	27° 43'.1	46° 53'.6 S
Alnilam	275° 46'.1	1° 11'.6 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 07'.9	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.7 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.9 N
Atria	107° 27'.9	69° 03'.2 S
Avior	234° 18'.2	59° 33'.1 S
Bellatrix	278° 31'.7	6° 21'.7 N
Betelgeuse	271° 01'.1	7° 24'.5 N
Canopus	263° 56'.1	52° 42'.0 S
Capella	280° 34'.0	46° 00'.4 N
Deneb	49° 31'.0	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.2	61° 40'.5 N
Elnath	278° 12'.3	28° 36'.9 N
Eltanin	90° 46'.1	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.4 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.4 S
Hamal	328° 00'.2	23° 31'.7 N
Kaus Aust.	83° 43'.5	34° 22'.6 S
Kochab	137° 21'.0	74° 06'.2 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.6	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.2 S
Miaplacidus	221° 40'.2	69° 46'.3 S
Mirfak	308° 39'.7	49° 54'.4 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.7	56° 41'.4 S
Polaris	317° 19'.9	89° 19'.1 N
Pollux	243° 27'.6	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.3 N
Rasalhague	96° 06'.3	12° 33'.4 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 11'.8	8° 11'.1 S
Rigil Kent	139° 51'.9	60° 53'.5 S
Sabik	102° 12'.4	15° 44'.3 S
Schedar	349° 39'.7	56° 36'.8 N
Shaula	96° 21'.7	37° 06'.7 S
Sirius	258° 33'.6	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.6	43° 29'.2 S
Vega	80° 38'.8	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	136° 07'.9	14:36
Mars	218° 59'.4	09:04
Jupiter	250° 46'.9	06:56
Saturn	142° 12'.8	14:09

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
182° 03'.7	0° 49'.9 S	296° 56'.4	11'.5	19° 06'.7 N	2'.3	54'.9
197° 03'.9	50'.9	311° 26'.9	11'.4	09'.0	2'.2	
212° 04'.1	51'.8	325° 57'.3	11'.5	11'.2	2'.1	
227° 04'.3	52'.8	340° 27'.8	11'.5	13'.3	2'.0	54'.8
242° 04'.5	53'.8	354° 58'.3	11'.5	15'.3	1'.9	
257° 04'.7	54'.8	9° 28'.8	11'.5	17'.2	1'.9	
272° 05'.0	55'.7	23° 59'.3	11'.5	19'.1	1'.7	
287° 05'.2	56'.7	38° 29'.8	11'.5	20'.8	1'.6	
302° 05'.4	57'.7	53° 00'.3	11'.5	22'.4	1'.6	54'.7
317° 05'.6	58'.7	67° 30'.8	11'.6	24'.0	1'.4	
332° 05'.8	59'.6	82° 01'.4	11'.5	25'.4	1'.4	
347° 06'.0	1° 00'.6 S	96° 31'.9	11'.6	26'.8	1'.2	
2° 06'.3	1° 01'.6 S	111° 02'.5	11'.6	19° 28'.0 N	1'.2	54'.7
17° 06'.5	02'.6	125° 33'.1	11'.6	29'.2	1'.1	
32° 06'.7	03'.5	140° 03'.7	11'.6	30'.3	1'.0	54'.6
47° 06'.9	04'.5	154° 34'.3	11'.6	31'.3	0'.9	
62° 07'.1	05'.5	169° 04'.9	11'.6	32'.2	0'.8	
77° 07'.3	06'.5	183° 35'.5	11'.7	33'.0	0'.7	
92° 07'.5	07'.4	198° 06'.2	11'.6	33'.7	0'.6	
107° 07'.8	08'.4	212° 36'.8	11'.7	34'.3	0'.5	
122° 08'.0	09'.4	227° 07'.5	11'.7	34'.8	0'.4	
137° 08'.2	10'.3	241° 38'.2	11'.7	35'.2	0'.3	54'.5
152° 08'.4	11'.3	256° 08'.9	11'.7	35'.5	0'.3	
167° 08'.6	12'.3	270° 39'.6	11'.7	35'.8	0'.1	
182° 08'.8	1° 13'.3 S	285° 10'.3	11'.8	19° 35'.9 N	0'.1	54'.5
197° 09'.0	14'.2	299° 41'.1	11'.8	36'.0	0'.1	
212° 09'.3	15'.2	314° 11'.9	11'.7	35'.9	0'.1	
227° 09'.5	16'.2	328° 42'.6	11'.8	35'.8	0'.2	
242° 09'.7	17'.2	343° 13'.4	11'.8	35'.6	0'.3	
257° 09'.9	18'.1	357° 44'.2	11'.9	35'.3	0'.5	54'.4
272° 10'.1	19'.1	12° 15'.1	11'.8	34'.8	0'.5	
287° 10'.3	20'.1	26° 45'.9	11'.9	34'.3	0'.5	
302° 10'.5	21'.1	41° 16'.8	11'.8	33'.8	0'.7	
317° 10'.8	22'.0	55° 47'.6	11'.9	33'.1	0'.8	
332° 11'.0	23'.0	70° 18'.5	12'.0	32'.3	0'.9	
347° 11'.2	24'.0	84° 49'.5	11'.9	31'.4	0'.9	
2° 11'.4	1° 24'.9 S	99° 20'.4	11'.9	19° 30'.5 N	1'.1	54'.4
17° 11'.6	25'.9	113° 51'.3	12'.0	29'.4	1'.1	
32° 11'.8	26'.9	128° 22'.3	12'.0	28'.3	1'.2	
47° 12'.0	27'.9	142° 53'.3	12'.0	27'.1	1'.4	54'.3
62° 12'.3	28'.8	157° 24'.3	12'.0	25'.7	1'.4	
77° 12'.5	29'.8	171° 55'.3	12'.0	24'.3	1'.5	
92° 12'.7	30'.8	186° 26'.3	12'.1	22'.8	1'.6	
107° 12'.9	31'.8	200° 57'.4	12'.1	21'.2	1'.6	
122° 13'.1	32'.7	215° 28'.5	12'.1	19'.6	1'.8	
137° 13'.3	33'.7	229° 59'.6	12'.1	17'.8	1'.9	
152° 13'.5	34'.7	244° 30'.7	12'.1	15'.9	1'.9	
167° 13'.7	35'.7	259° 01'.8	12'.2	14'.0	2'.0	
182° 14'.0	1° 36'.6 S	273° 33'.0	12'.2	19° 12'.0 N	2'.1	54'.3
197° 14'.2	37'.6	288° 04'.2	12'.2	09'.9	2'.3	
212° 14'.4	38'.6	302° 35'.4	12'.2	07'.6	2'.2	
227° 14'.6	39'.5	317° 06'.6	12'.2	05'.4	2'.4	
242° 14'.8	40'.5	331° 37'.8	12'.3	03'.0	2'.5	
257° 15'.0	41'.5	346° 09'.1	12'.2	00'.5	2'.6	
272° 15'.2	42'.5	0° 40'.3	12'.3	18° 57'.9 N	2'.6	
287° 15'.4	43'.4	15° 11'.6	12'.3	55'.3	2'.7	
302° 15'.7	44'.4	29° 42'.9	12'.4	52'.6	2'.8	
317° 15'.9	45'.4	44° 14'.3	12'.3	49'.8	2'.9	54'.2
332° 16'.1	46'.4	58° 45'.6	12'.4	46'.9	3'.0	
347° 16'.3	47'.3	73° 17'.0	12'.4	43'.9	3'.1	
2° 16'.5	1° 48'.3 S	87° 48'.4	12'.4	18° 40'.8 N	3'.2	54'.2
17° 16'.7	49'.3	102° 19'.8	12'.5	37'.6	3'.2	
32° 16'.9	50'.3	116° 51'.3	12'.4	34'.4	3'.3	
47° 17'.1	51'.2	131° 22'.7	12'.5	31'.1	3'.4	
62° 17'.3	52'.2	145° 54'.2	12'.5	27'.7	3'.5	
77° 17'.6	53'.2	160° 25'.7	12'.6	24'.2	3'.6	
92° 17'.8	54'.1	174° 57'.3	12'.5	20'.6	3'.7	
107° 18'.0	55'.1	189° 28'.8	12'.6	16'.9	3'.7	
122° 18'.2	56'.1	204° 00'.4	12'.6	13'.2	3'.8	
137° 18'.4	57'.1	218° 32'.0	12'.6	09'.4	3'.9	
152° 18'.6	58'.0	233° 03'.6	12'.6	05'.5	4'.0	
167° 18'.8	59'.0	247° 35'.2	12'.6	01'.5	4'.1	
SD 16'.0	d 1'.0	SD	14'.9	14'.8	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 25	Moonrise 26	Moonrise 27
N 72°	03:23	04:49	05:57	-	-	-
N 70°	03:39	04:55	05:56	17:42	18:40	20:08
68°	03:51	05:00	05:55	18:45	19:38	20:50
66°	04:02	05:04	05:55	19:20	20:12	21:18
64°	04:10	05:07	05:55	19:45	20:37	21:40
62°	04:17	05:10	05:54	20:05	20:56	21:57
60°	04:23	05:12	05:54	20:21	21:12	22:11
N 58°	04:28	05:14	05:53	20:35	21:26	22:23
56°	04:32	05:16	05:53	20:47	21:37	22:34
54°	04:36	05:18	05:53	20:57	21:47	22:43
52°	04:39	05:19	05:53	21:06	21:56	22:52
50°	04:42	05:20	05:52	21:14	22:04	22:59
45°	04:48	05:23	05:52	21:32	22:21	23:15
N 40°	04:53	05:24	05:51	21:46	22:35	23:28
35°	04:56	05:26	05:51	21:58	22:47	23:39
30°	04:59	05:27	05:51	22:09	22:58	23:48
20°	05:02	05:28	05:50	22:27	23:16	24:05
N 10°	05:04	05:28	05:49	22:43	23:31	24:19
0°	05:03	05:27	05:48	22:58	23:46	24:33
S 10°	05:02	05:26	05:47	23:13	-	00:00
20°	04:58	05:24	05:46	23:28	-	00:16
30°	04:53	05:21	05:44	23:47	-	00:34
35°	04:49	05:18	05:44	23:57	-	00:44
40°	04:44	05:16	05:43	-	00:10	00:56
45°	04:37	05:12	05:41	-	00:24	01:10
S 50°	04:29	05:08	05:40	-	00:42	01:27
52°	04:25	05:05	05:39	-	00:50	01:35
54°	04:21	05:03	05:38	00:07	00:59	01:44
56°	04:16	05:00	05:38	00:17	01:10	01:54
58°	04:10	04:57	05:37	00:29	01:22	02:06
S 60°	04:03	04:54	05:36	00:42	01:36	02:19
S 62°	03:55	04:50	05:34	00:58	01:52	02:34

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 25	Moonset 26	Moonset 27
N 72°	17:43	18:51	20:16	-	-	-
N 70°	17:44	18:45	20:00	15:47	16:29	16:40
68°	17:45	18:40	19:48	14:44	15:31	15:57
66°	17:46	18:37	19:38	14:09	14:57	15:29
64°	17:46	18:34	19:30	13:44	14:32	15:07
62°	17:47	18:31	19:24	13:24	14:12	14:49
60°	17:47	18:29	19:18	13:08	13:56	14:35
N 58°	17:48	18:27	19:13	12:55	13:43	14:22
56°	17:48	18:25	19:09	12:43	13:31	14:12
54°	17:49	18:24	19:05	12:33	13:21	14:02
52°	17:49	18:22	19:02	12:24	13:12	13:54
50°	17:49	18:21	18:59	12:15	13:04	13:46
45°	17:50	18:19	18:53	11:58	12:46	13:30
N 40°	17:50	18:17	18:49	11:44	12:32	13:16
35°	17:51	18:16	18:46	11:32	12:20	13:05
30°	17:52	18:15	18:43	11:21	12:10	12:55
20°	17:53	18:14	18:40	11:03	11:52	12:38
N 10°	17:53	18:14	18:39	10:47	11:36	12:23
0°	17:54	18:15	18:39	10:33	11:21	12:09
S 10°	17:56	18:17	18:41	10:18	11:06	11:55
20°	17:57	18:19	18:45	10:02	10:50	11:39
30°	17:59	18:22	18:50	09:44	10:32	11:22
35°	17:59	18:25	18:54	09:33	10:21	11:12
40°	18:01	18:28	19:00	09:21	10:09	11:00
45°	18:02	18:31	19:06	09:07	09:55	10:47
S 50°	18:04	18:36	19:14	08:50	09:37	10:30
52°	18:04	18:38	19:19	08:41	09:29	10:22
54°	18:05	18:41	19:23	08:32	09:20	10:13
56°	18:06	18:44	19:28	08:22	09:09	10:03
58°	18:07	18:47	19:34	08:10	08:57	09:52
S 60°	18:08	18:50	19:41	07:57	08:43	09:39
S 62°	18:10	18:54	19:49	07:41	08:27	09:23

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
25	8 14	8 25	11:52	04:21	16:45	20d 66%
26	8 35	8 45	11:51	05:09	17:33	21d 56%
27	8 55	9 06	11:51	05:57	18:21	22d 47%

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2013 September 28, 29, 30 (Sat, Sun, Mon)

GMT	ARIES	VENUS -4.2		MARS +1.6		JUPITER -2.2		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
28 Saturday 00	6° 56'.1	140° 49'.0	19° 20'.2 S	224° 41'.9	16° 10'.7 N	257° 27'.4	22° 08'.9 N	148° 56'.8	12° 39'.2 S
01	21° 58'.5	155° 48'.6	21'.1	239° 42'.9	10'.3	272° 29'.5	08'.9	163° 59'.0	39'.3
02	37° 01'.0	170° 48'.3	22'.1	254° 43'.8	09'.8	287° 31'.6	08'.8	179° 01'.2	39'.4
03	52° 03'.5	185° 47'.9	23'.0	269° 44'.8	09'.3	302° 33'.8	08'.8	194° 03'.4	39'.5
04	67° 05'.9	200° 47'.6	23'.9	284° 45'.7	08'.9	317° 35'.9	08'.8	209° 05'.6	39'.6
05	82° 08'.4	215° 47'.2	24'.9	299° 46'.6	08'.4	332° 38'.1	08'.7	224° 07'.8	39'.7
06	97° 10'.9	230° 46'.9	25'.8	314° 47'.6	08'.0	347° 40'.2	08'.7	239° 10'.0	39'.7
07	112° 13'.3	245° 46'.5	26'.7	329° 48'.5	07'.5	2° 42'.4	08'.7	254° 12'.2	39'.8
08	127° 15'.8	260° 46'.1	27'.7	344° 49'.5	07'.0	17° 44'.5	08'.6	269° 14'.4	39'.9
09	142° 18'.3	275° 45'.8	28'.6	359° 50'.4	06'.6	32° 46'.7	08'.6	284° 16'.6	40'.0
10	157° 20'.7	290° 45'.4	29'.5	14° 51'.3	06'.1	47° 48'.8	08'.6	299° 18'.8	40'.1
11	172° 23'.2	305° 45'.1	30'.5	29° 52'.3	05'.6	62° 51'.0	08'.5	314° 21'.1	40'.2
12	187° 25'.7	320° 44'.7	19° 31'.4 S	44° 53'.2	16° 05'.2 N	77° 53'.1	22° 08'.5 N	329° 23'.3	12° 40'.3 S
13	202° 28'.1	335° 44'.3	32'.3	59° 54'.2	04'.7	92° 55'.3	08'.5	344° 25'.5	40'.4
14	217° 30'.6	350° 44'.0	33'.2	74° 55'.1	04'.3	107° 57'.4	08'.4	359° 27'.7	40'.5
15	232° 33'.0	5° 43'.6	34'.2	89° 56'.0	03'.8	122° 59'.6	08'.4	14° 29'.9	40'.5
16	247° 35'.5	20° 43'.3	35'.1	104° 57'.0	03'.3	138° 01'.7	08'.4	29° 32'.1	40'.6
17	262° 38'.0	35° 42'.9	36'.0	119° 57'.9	02'.9	153° 03'.9	08'.3	44° 34'.3	40'.7
18	277° 40'.4	50° 42'.5	36'.9	134° 58'.9	02'.4	168° 06'.0	08'.3	59° 36'.5	40'.8
19	292° 42'.9	65° 42'.2	37'.9	149° 59'.8	01'.9	183° 08'.2	08'.2	74° 38'.7	40'.9
20	307° 45'.4	80° 41'.8	38'.8	165° 00'.7	01'.5	198° 10'.3	08'.2	89° 40'.9	41'.0
21	322° 47'.8	95° 41'.5	39'.7	180° 01'.7	01'.0	213° 12'.5	08'.2	104° 43'.1	41'.1
22	337° 50'.3	110° 41'.1	40'.6	195° 02'.6	00'.5	228° 14'.6	08'.1	119° 45'.3	41'.2
23	352° 52'.8	125° 40'.7	41'.6	210° 03'.6	00'.1	243° 16'.8	08'.1	134° 47'.5	41'.3
29 Sunday 00	7° 55'.2	140° 40'.4	19° 42'.5 S	225° 04'.5	15° 59'.6 N	258° 18'.9	22° 08'.1 N	149° 49'.8	12° 41'.3 S
01	22° 57'.7	155° 40'.0	43'.4	240° 05'.5	59'.1	273° 21'.1	08'.0	164° 52'.0	41'.4
02	38° 00'.1	170° 39'.6	44'.3	255° 06'.4	58'.7	288° 23'.2	08'.0	179° 54'.2	41'.5
03	53° 02'.6	185° 39'.3	45'.2	270° 07'.3	58'.2	303° 25'.4	08'.0	194° 56'.4	41'.6
04	68° 05'.1	200° 38'.9	46'.1	285° 08'.3	57'.8	318° 27'.5	07'.9	209° 58'.6	41'.7
05	83° 07'.5	215° 38'.6	47'.1	300° 09'.2	57'.3	333° 29'.7	07'.9	225° 00'.8	41'.8
06	98° 10'.0	230° 38'.2	48'.0	315° 10'.2	56'.8	348° 31'.8	07'.9	240° 03'.0	41'.9
07	113° 12'.5	245° 37'.8	48'.9	330° 11'.1	56'.4	3° 34'.0	07'.8	255° 05'.2	42'.0
08	128° 14'.9	260° 37'.5	49'.8	345° 12'.1	55'.9	18° 36'.1	07'.8	270° 07'.4	42'.1
09	143° 17'.4	275° 37'.1	50'.7	0° 13'.0	55'.4	33° 38'.3	07'.8	285° 09'.6	42'.1
10	158° 19'.9	290° 36'.7	51'.6	15° 14'.0	55'.0	48° 40'.4	07'.7	300° 11'.8	42'.2
11	173° 22'.3	305° 36'.4	52'.5	30° 14'.9	54'.5	63° 42'.6	07'.7	315° 14'.0	42'.3
12	188° 24'.8	320° 36'.0	19° 53'.4 S	45° 15'.8	15° 54'.0 N	78° 44'.8	22° 07'.7 N	330° 16'.2	12° 42'.4 S
13	203° 27'.3	335° 35'.6	54'.4	60° 16'.8	53'.6	93° 46'.9	07'.6	345° 18'.4	42'.5
14	218° 29'.7	350° 35'.3	55'.3	75° 17'.7	53'.1	108° 49'.1	07'.6	0° 20'.6	42'.6
15	233° 32'.2	5° 34'.9	56'.2	90° 18'.7	52'.6	123° 51'.2	07'.6	15° 22'.9	42'.7
16	248° 34'.6	20° 34'.5	57'.1	105° 19'.6	52'.2	138° 53'.4	07'.5	30° 25'.1	42'.8
17	263° 37'.1	35° 34'.2	58'.0	120° 20'.6	51'.7	153° 55'.5	07'.5	45° 27'.3	42'.8
18	278° 39'.6	50° 33'.8	58'.9	135° 21'.5	51'.2	168° 57'.7	07'.5	60° 29'.5	42'.9
19	293° 42'.0	65° 33'.4	59'.8	150° 22'.5	50'.8	183° 59'.9	07'.4	75° 31'.7	43'.0
20	308° 44'.5	80° 33'.1	20° 00'.7 S	165° 23'.4	50'.3	199° 02'.0	07'.4	90° 33'.9	43'.1
21	323° 47'.0	95° 32'.7	01'.6	180° 24'.4	49'.8	214° 04'.2	07'.4	105° 36'.1	43'.2
22	338° 49'.4	110° 32'.3	02'.5	195° 25'.3	49'.4	229° 06'.3	07'.3	120° 38'.3	43'.3
23	353° 51'.9	125° 31'.9	03'.4	210° 26'.3	48'.9	244° 08'.5	07'.3	135° 40'.5	43'.4
30 Monday 00	8° 54'.4	140° 31'.6	20° 04'.3 S	225° 27'.2	15° 48'.4 N	259° 10'.6	22° 07'.2 N	150° 42'.7	12° 43'.5 S
01	23° 56'.8	155° 31'.2	05'.2	240° 28'.1	47'.9	274° 12'.8	07'.2	165° 44'.9	43'.6
02	38° 59'.3	170° 30'.8	06'.1	255° 29'.1	47'.5	289° 15'.0	07'.2	180° 47'.1	43'.6
03	54° 01'.8	185° 30'.5	07'.0	270° 30'.0	47'.0	304° 17'.1	07'.1	195° 49'.3	43'.7
04	69° 04'.2	200° 30'.1	07'.9	285° 31'.0	46'.5	319° 19'.3	07'.1	210° 51'.5	43'.8
05	84° 06'.7	215° 29'.7	08'.8	300° 31'.9	46'.1	334° 21'.4	07'.1	225° 53'.7	43'.9
06	99° 09'.1	230° 29'.4	09'.7	315° 32'.9	45'.6	349° 23'.6	07'.0	240° 55'.9	44'.0
07	114° 11'.6	245° 29'.0	10'.6	330° 33'.8	45'.1	4° 25'.8	07'.0	255° 58'.1	44'.1
08	129° 14'.1	260° 28'.6	11'.5	345° 34'.8	44'.7	19° 27'.9	07'.0	271° 00'.3	44'.2
09	144° 16'.5	275° 28'.2	12'.4	0° 35'.7	44'.2	34° 30'.1	06'.9	286° 02'.6	44'.3
10	159° 19'.0	290° 27'.9	13'.3	15° 36'.7	43'.7	49° 32'.2	06'.9	301° 04'.8	44'.4
11	174° 21'.5	305° 27'.5	14'.2	30° 37'.6	43'.3	64° 34'.4	06'.9	316° 07'.0	44'.4
12	189° 23'.9	320° 27'.1	20° 15'.0 S	45° 38'.6	15° 42'.8 N	79° 36'.6	22° 06'.8 N	331° 09'.2	12° 44'.5 S
13	204° 26'.4	335° 26'.7	15'.9	60° 39'.5	42'.3	94° 38'.7	06'.8	346° 11'.4	44'.6
14	219° 28'.9	350° 26'.4	16'.8	75° 40'.5	41'.9	109° 40'.9	06'.8	1° 13'.6	44'.7
15	234° 31'.3	5° 26'.0	17'.7	90° 41'.4	41'.4	124° 43'.0	06'.7	16° 15'.8	44'.8
16	249° 33'.8	20° 25'.6	18'.6	105° 42'.4	40'.9	139° 45'.2	06'.7	31° 18'.0	44'.9
17	264° 36'.2	35° 25'.3	19'.5	120° 43'.3	40'.4	154° 47'.4	06'.7	46° 20'.2	45'.0
18	279° 38'.7	50° 24'.9	20'.4	135° 44'.3	40'.0	169° 49'.5	06'.6	61° 22'.4	45'.1
19	294° 41'.2	65° 24'.5	21'.3	150° 45'.2	39'.5	184° 51'.7	06'.6	76° 24'.6	45'.2
20	309° 43'.6	80° 24'.1	22'.1	165° 46'.2	39'.0	199° 53'.9	06'.6	91° 26'.8	45'.3
21	324° 46'.1	95° 23'.7	23'.0	180° 47'.1	38'.6	214° 56'.0	06'.5	106° 29'.0	45'.3
22	339° 48'.6	110° 23'.4	23'.9	195° 48'.1	38'.1	229° 58'.2	06'.5	121° 31'.2	45'.4
23	354° 51'.0	125° 23'.0	24'.8	210° 49'.1	37'.6	245° 00'.4	06'.5	136° 33'.4	45'.5
	M.P. 23:24	v -0'.4	d 0'.9	v 0'.9	d 0'.5	v 2'.2	d 0'.0	v 2'.2	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 17'.9	40° 14'.8 S
Achernar	335° 26'.1	57° 09'.9 S
Acrux	173° 09'.7	63° 10'.5 S
Adhara	255° 12'.4	28° 59'.3 S
Aldebaran	290° 49'.0	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.2 N
Alkaid	152° 59'.2	49° 14'.9 N
Alnair	27° 43'.1	46° 53'.6 S
Alnilam	275° 46'.1	1° 11'.6 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 07'.9	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.7 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.9 N
Atria	107° 28'.0	69° 03'.2 S
Avior	234° 18'.2	59° 33'.1 S
Bellatrix	278° 31'.7	6° 21'.7 N
Betelgeuse	271° 01'.0	7° 24'.5 N
Canopus	263° 56'.0	52° 42'.0 S
Capella	280° 34'.0	46° 00'.4 N
Deneb	49° 31'.1	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.8 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.5 N
Elnath	278° 12'.3	28° 36'.9 N
Eltanin	90° 46'.1	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.4 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.4 S
Hamal	328° 00'.2	23° 31'.7 N
Kaus Aust.	83° 43'.6	34° 22'.6 S
Kochab	137° 21'.1	74° 06'.2 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.6	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.2 S
Miaplacidus	221° 40'.1	69° 46'.3 S
Mirfak	308° 39'.7	49° 54'.4 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.7	56° 41'.4 S
Polaris	317° 18'.8	89° 19'.2 N
Pollux	243° 27'.6	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.3 N
Rasalhague	96° 06'.3	12° 33'.4 N
Regulus	207° 43'.6	11° 54'.0 N
Rigel	281° 11'.8	8° 11'.1 S
Rigil Kent	139° 51'.9	60° 53'.5 S
Sabik	102° 12'.4	15° 44'.3 S
Schedar	349° 39'.6	56° 36'.9 N
Shaula	96° 21'.7	37° 06'.7 S
Sirius	258° 33'.6	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.5	43° 29'.2 S
Vega	80° 38'.8	38° 48'.3 N
Zuben'ubi	137° 05'.4	16° 05'.8 S
	SHA	Mer.Pass.
Venus	132° 45'.2	14:38
Mars	217° 09'.3	08:59
Jupiter	250° 23'.7	06:46
Saturn	141° 54'.5	13:59

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
182° 19'.0	2° 00'.0 S	262° 06'.8	12'.7	17° 57'.4 N	4'.2	54'.2
197° 19'.2	2° 01'.0 S	276° 38'.5	12'.7	53'.2	4'.2	
212° 19'.4	01'.9	291° 10'.2	12'.7	49'.0	4'.3	
227° 19'.7	02'.9	305° 41'.9	12'.8	44'.7	4'.4	
242° 19'.9	03'.9	320° 13'.7	12'.7	40'.3	4'.5	
257° 20'.1	04'.8	334° 45'.4	12'.8	35'.8	4'.5	54'.3
272° 20'.3	05'.8	349° 17'.2	12'.8	31'.3	4'.7	
287° 20'.5	06'.8	3° 49'.0	12'.8	26'.6	4'.7	
302° 20'.7	07'.8	18° 20'.8	12'.9	21'.9	4'.8	
317° 20'.9	08'.7	32° 52'.7	12'.8	17'.1	4'.8	
332° 21'.1	09'.7	47° 24'.5	12'.9	12'.3	5'.0	
347° 21'.3	10'.7	61° 56'.4	12'.9	07'.3	5'.0	
2° 21'.5	2° 11'.7 S	76° 28'.3	12'.9	17° 02'.3 N	5'.1	54'.3
17° 21'.8	12'.6	91° 00'.2	13'.0	16° 57'.2 N	5'.2	
32° 22'.0	13'.6	105° 32'.2	12'.9	52'.0	5'.2	
47° 22'.2	14'.6	120° 04'.1	13'.0	46'.8	5'.4	
62° 22'.4	15'.5	134° 36'.1	13'.0	41'.4	5'.4	
77° 22'.6	16'.5	149° 08'.1	13'.0	36'.0	5'.5	
92° 22'.8	17'.5	163° 40'.1	13'.1	30'.5	5'.5	
107° 23'.0	18'.5	178° 12'.2	13'.0	25'.0	5'.6	
122° 23'.2	19'.4	192° 44'.2	13'.1	19'.4	5'.7	
137° 23'.4	20'.4	207° 16'.3	13'.1	13'.7	5'.8	
152° 23'.6	21'.4	221° 48'.4	13'.1	07'.9	5'.9	
167° 23'.8	22'.3	236° 20'.5	13'.2	02'.0	5'.9	54'.4
182° 24'.0	2° 23'.3 S	250° 52'.7	13'.1	15° 56'.1 N	6'.0	54'.4
197° 24'.2	24'.3	265° 24'.8	13'.2	50'.1	6'.1	
212° 24'.5	25'.3	279° 57'.0	13'.2	44'.0	6'.1	
227° 24'.7	26'.2	294° 29'.2	13'.2	37'.9	6'.2	
242° 24'.9	27'.2	309° 01'.4	13'.2	31'.7	6'.3	
257° 25'.1	28'.2	323° 33'.6	13'.3	25'.4	6'.4	
272° 25'.3	29'.1	338° 05'.9	13'.2	19'.0	6'.4	
287° 25'.5	30'.1	352° 38'.1	13'.3	12'.6	6'.5	
302° 25'.7	31'.1	7° 10'.4	13'.3	06'.1	6'.6	
317° 25'.9	32'.1	21° 42'.7	13'.3	14° 59'.5 N	6'.6	54'.5
332° 26'.1	33'.0	36° 15'.0	13'.3	52'.9	6'.7	
347° 26'.3	34'.0	50° 47'.3	13'.4	46'.2	6'.8	
2° 26'.5	2° 35'.0 S	65° 19'.7	13'.3	14° 39'.4 N	6'.8	54'.5
17° 26'.7	35'.9	79° 52'.0	13'.4	32'.6	6'.9	
32° 26'.9	36'.9	94° 24'.4	13'.4	25'.7	7'.0	
47° 27'.1	37'.9	108° 56'.8	13'.4	18'.7	7'.1	
62° 27'.3	38'.9	123° 29'.2	13'.4	11'.6	7'.1	
77° 27'.5	39'.8	138° 01'.6	13'.5	04'.5	7'.1	54'.6
92° 27'.8	40'.8	152° 34'.1	13'.4	13° 57'.4 N	7'.3	
107° 28'.0	41'.8	167° 06'.5	13'.5	50'.1	7'.3	
122° 28'.2	42'.7	181° 39'.0	13'.5	42'.8	7'.4	
137° 28'.4	43'.7	196° 11'.5	13'.5	35'.4	7'.4	
152° 28'.6	44'.7	210° 44'.0	13'.5	28'.0	7'.5	
167° 28'.8	45'.7	225° 16'.5	13'.5	20'.5	7'.5	
182° 29'.0	2° 46'.6 S	239° 49'.0	13'.5	13° 13'.0 N	7'.7	54'.7
197° 29'.2	47'.6	254° 21'.5	13'.5	05'.3	7'.7	
212° 29'.4	48'.6	268° 54'.0	13'.6	12° 57'.6 N	7'.7	
227° 29'.6	49'.5	283° 26'.6	13'.6	49'.9	7'.8	
242° 29'.8	50'.5	297° 59'.2	13'.5	42'.1	7'.9	
257° 30'.0	51'.5	312° 31'.7	13'.6	34'.2	7'.9	
272° 30'.2	52'.5	327° 04'.3	13'.6	26'.3	8'.0	
287° 30'.4	53'.4	341° 36'.9	13'.6	18'.3	8'.0	54'.8
302° 30'.6	54'.4	356° 09'.5	13'.6	10'.3	8'.2	
317° 30'.8	55'.4	10° 42'.1	13'.6	02'.1	8'.1	
332° 31'.0	56'.3	25° 14'.7	13'.7	11° 54'.0 N	8'.2	
347° 31'.2	57'.3	39° 47'.4	13'.6	45'.8	8'.3	
2° 31'.4	2° 58'.3 S	54° 20'.0	13'.7	11° 37'.5 N	8'.4	54'.9
17° 31'.6	59'.3	68° 52'.7	13'.6	29'.1	8'.4	
32° 31'.8	3° 00'.2 S	83° 25'.3	13'.7	20'.7	8'.4	
47° 32'.0	01'.2	97° 58'.0	13'.6	12'.3	8'.5	
62° 32'.2	02'.2	112° 30'.6	13'.7	03'.8	8'.6	
77° 32'.4	03'.1	127° 03'.3	13'.7	10° 55'.2 N	8'.6	
92° 32'.6	04'.1	141° 36'.0	13'.7	46'.6	8'.7	55'.0
107° 32'.8	05'.1	156° 08'.7	13'.7	37'.9	8'.7	
122° 33'.1	06'.0	170° 41'.4	13'.7	29'.2	8'.8	
137° 33'.3	07'.0	185° 14'.1	13'.6	20'.4	8'.8	
152° 33'.5	08'.0	199° 46'.7	13'.7	11'.6	8'.9	
167° 33'.7	09'.0	214° 19'.4	13'.8	02'.7	8'.9	55'.1
SD 16'.0	d 1'.0	SD	14'.8	14'.8	14'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30
N 72°	03:39	05:03	06:10	20:59	22:53	24:39
N 70°	03:53	05:07	06:08	21:43	23:19	24:55
68°	04:04	05:11	06:06	22:12	23:39	25:07
66°	04:12	05:13	06:04	22:34	23:54	25:18
64°	04:19	05:16	06:03	22:51	-	00:07
62°	04:25	05:18	06:02	23:05	-	00:18
60°	04:30	05:19	06:01	23:17	-	00:27
N 58°	04:35	05:21	06:00	23:27	-	00:35
56°	04:38	05:22	05:59	23:36	-	00:42
54°	04:42	05:23	05:58	23:44	-	00:48
52°	04:45	05:24	05:58	23:51	-	00:54
50°	04:47	05:25	05:57	23:57	-	00:59
45°	04:52	05:26	05:56	-	00:11	01:10
N 40°	04:56	05:27	05:54	-	00:22	01:19
35°	04:59	05:28	05:53	-	00:32	01:27
30°	05:01	05:28	05:52	-	00:40	01:33
20°	05:03	05:28	05:50	00:05	00:55	01:45
N 10°	05:03	05:28	05:49	00:19	01:08	01:55
0°	05:02	05:26	05:47	00:33	01:19	02:05
S 10°	05:00	05:24	05:45	00:46	01:31	02:15
20°	04:55	05:21	05:43	01:01	01:44	02:25
30°	04:49	05:17	05:41	01:17	01:58	02:36
35°	04:44	05:14	05:39	01:27	02:06	02:43
40°	04:39	05:11	05:38	01:38	02:16	02:51
45°	04:31	05:06	05:36	01:51	02:27	02:59
S 50°	04:22	05:01	05:33	02:06	02:40	03:10
52°	04:18	04:58	05:32	02:13	02:46	03:15
54°	04:13	04:55	05:31	02:22	02:53	03:20
56°	04:07	04:52	05:30	02:31	03:01	03:26
58°	04:00	04:49	05:28	02:41	03:09	03:33
S 60°	03:53	04:44	05:26	02:53	03:19	03:41
S 62°	03:44	04:40	05:25	03:06	03:30	03:49

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 28	Moonset 29	Moonset 30
N 72°	17:28	18:35	19:58	17:26	17:08	16:56
N 70°	17:31	18:31	19:45	16:41	16:41	16:38
68°	17:33	18:28	19:34	16:12	16:20	16:25
66°	17:34	18:25	19:26	15:50	16:03	16:13
64°	17:36	18:23	19:19	15:32	15:50	16:04
62°	17:37	18:21	19:13	15:17	15:38	15:55
60°	17:38	18:20	19:08	15:05	15:29	15:48
N 58°	17:39	18:18	19:04	14:54	15:20	15:42
56°	17:40	18:17	19:01	14:45	15:13	15:36
54°	17:41	18:16	18:57	14:37	15:06	15:31
52°	17:42	18:15	18:55	14:29	15:00	15:27
50°	17:43	18:15	18:52	14:22	14:54	15:23
45°	17:44	18:13	18:47	14:08	14:42	15:14
N 40°	17:46	18:12	18:44	13:56	14:32	15:06
35°	17:47	18:12	18:41	13:46	14:24	15:00
30°	17:48	18:12	18:39	13:37	14:17	14:54
20°	17:50	18:12	18:37	13:22	14:04	14:44
N 10°	17:52	18:13	18:37	13:08	13:52	14:35
0°	17:53	18:14	18:38	12:55	13:41	14:27
S 10°	17:55	18:16	18:41	12:43	13:31	14:18
20°	17:58	18:20	18:45	12:29	13:19	14:09
30°	18:00	18:24	18:52	12:13	13:06	13:59
35°	18:02	18:27	18:57	12:04	12:58	13:53
40°	18:04	18:31	19:03	11:54	12:49	13:46
45°	18:06	18:35	19:10	11:41	12:39	13:39
S 50°	18:08	18:41	19:19	11:26	12:26	13:29
52°	18:09	18:43	19:24	11:19	12:21	13:25
54°	18:11	18:46	19:29	11:12	12:14	13:20
56°	18:12	18:50	19:35	11:03	12:07	13:14
58°	18:14	18:53	19:42	10:53	11:59	13:08
S 60°	18:15	18:58	19:50	10:42	11:50	13:01
S 62°	18:18	19:03	19:59	10:28	11:39	12:53

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
28	9 16	9 26	11:51	06:44	19:07	23d 38%
29	9 36	9 46	11:50	07:30	19:53	24d 29%
30	9 56	10 05	11:50	08:16	20:38	25d 20%

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2013 October 1, 2, 3 (Tue, Wed, Thur)

GMT	ARIES	VENUS -4.2		MARS +1.6		JUPITER -2.2		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
Tuesday 1									
00	9° 53'.5	140° 22'.6	20° 25'.7 S	225° 50'.0	15° 37'.1 N	260° 02'.5	22° 06'.4 N	151° 35'.6	12° 45'.6 S
01	24° 56'.0	155° 22'.2	26'.6	240° 51'.0	36'.7	275° 04'.7	06'.4	166° 37'.8	45'.7
02	39° 58'.4	170° 21'.9	27'.4	255° 51'.9	36'.2	290° 06'.9	06'.4	181° 40'.0	45'.8
03	55° 00'.9	185° 21'.5	28'.3	270° 52'.9	35'.7	305° 09'.0	06'.3	196° 42'.2	45'.9
04	70° 03'.4	200° 21'.1	29'.2	285° 53'.8	35'.3	320° 11'.2	06'.3	211° 44'.4	46'.0
05	85° 05'.8	215° 20'.7	30'.1	300° 54'.8	34'.8	335° 13'.4	06'.3	226° 46'.6	46'.1
06	100° 08'.3	230° 20'.4	31'.0	315° 55'.7	34'.3	350° 15'.5	06'.2	241° 48'.8	46'.1
07	115° 10'.7	245° 20'.0	31'.8	330° 56'.7	33'.8	5° 17'.7	06'.2	256° 51'.0	46'.2
08	130° 13'.2	260° 19'.6	32'.7	345° 57'.6	33'.4	20° 19'.9	06'.2	271° 53'.2	46'.3
09	145° 15'.7	275° 19'.2	33'.6	0° 58'.6	32'.9	35° 22'.0	06'.1	286° 55'.4	46'.4
10	160° 18'.1	290° 18'.8	34'.5	15° 59'.5	32'.4	50° 24'.2	06'.1	301° 57'.6	46'.5
11	175° 20'.6	305° 18'.5	35'.3	31° 00'.5	32'.0	65° 26'.4	06'.1	316° 59'.9	46'.6
12	190° 23'.1	320° 18'.1	20° 36'.2 S	46° 01'.5	15° 31'.5 N	80° 28'.5	22° 06'.0 N	332° 02'.1	12° 46'.7 S
13	205° 25'.5	335° 17'.7	37'.1	61° 02'.4	31'.0	95° 30'.7	06'.0	347° 04'.3	46'.8
14	220° 28'.0	350° 17'.3	37'.9	76° 03'.4	30'.5	110° 32'.9	06'.0	2° 06'.5	46'.9
15	235° 30'.5	5° 16'.9	38'.8	91° 04'.3	30'.1	125° 35'.0	05'.9	17° 08'.7	46'.9
16	250° 32'.9	20° 16'.6	39'.7	106° 05'.3	29'.6	140° 37'.2	05'.9	32° 10'.9	47'.0
17	265° 35'.4	35° 16'.2	40'.5	121° 06'.2	29'.1	155° 39'.4	05'.9	47° 13'.1	47'.1
18	280° 37'.8	50° 15'.8	41'.4	136° 07'.2	28'.6	170° 41'.5	05'.8	62° 15'.3	47'.2
19	295° 40'.3	65° 15'.4	42'.3	151° 08'.1	28'.2	185° 43'.7	05'.8	77° 17'.5	47'.3
20	310° 42'.8	80° 15'.0	43'.1	166° 09'.1	27'.7	200° 45'.9	05'.8	92° 19'.7	47'.4
21	325° 45'.2	95° 14'.6	44'.0	181° 10'.1	27'.2	215° 48'.1	05'.7	107° 21'.9	47'.5
22	340° 47'.7	110° 14'.3	44'.9	196° 11'.0	26'.7	230° 50'.2	05'.7	122° 24'.1	47'.6
23	355° 50'.2	125° 13'.9	45'.7	211° 12'.0	26'.3	245° 52'.4	05'.7	137° 26'.3	47'.7
Wednesday 2									
00	10° 52'.6	140° 13'.5	20° 46'.6 S	226° 12'.9	15° 25'.8 N	260° 54'.6	22° 05'.6 N	152° 28'.5	12° 47'.8 S
01	25° 55'.1	155° 13'.1	47'.5	241° 13'.9	25'.3	275° 56'.7	05'.6	167° 30'.7	47'.8
02	40° 57'.6	170° 12'.7	48'.3	256° 14'.8	24'.9	290° 58'.9	05'.6	182° 32'.9	47'.9
03	56° 00'.0	185° 12'.3	49'.2	271° 15'.8	24'.4	306° 01'.1	05'.5	197° 35'.1	48'.0
04	71° 02'.5	200° 12'.0	50'.0	286° 16'.8	23'.9	321° 03'.3	05'.5	212° 37'.3	48'.1
05	86° 05'.0	215° 11'.6	50'.9	301° 17'.7	23'.4	336° 05'.4	05'.5	227° 39'.5	48'.2
06	101° 07'.4	230° 11'.2	51'.8	316° 18'.7	23'.0	351° 07'.6	05'.4	242° 41'.7	48'.3
07	116° 09'.9	245° 10'.8	52'.6	331° 19'.6	22'.5	6° 09'.8	05'.4	257° 43'.9	48'.4
08	131° 12'.3	260° 10'.4	53'.5	346° 20'.6	22'.0	21° 12'.0	05'.4	272° 46'.1	48'.5
09	146° 14'.8	275° 10'.0	54'.3	1° 21'.6	21'.5	36° 14'.1	05'.3	287° 48'.3	48'.6
10	161° 17'.3	290° 09'.6	55'.2	16° 22'.5	21'.1	51° 16'.3	05'.3	302° 50'.5	48'.6
11	176° 19'.7	305° 09'.3	56'.0	31° 23'.5	20'.6	66° 18'.5	05'.3	317° 52'.7	48'.7
12	191° 22'.2	320° 08'.9	20° 56'.9 S	46° 24'.4	15° 20'.1 N	81° 20'.7	22° 05'.2 N	332° 54'.9	12° 48'.8 S
13	206° 24'.7	335° 08'.5	57'.7	61° 25'.4	19'.6	96° 22'.8	05'.2	347° 57'.1	48'.9
14	221° 27'.1	350° 08'.1	58'.6	76° 26'.4	19'.2	111° 25'.0	05'.2	2° 59'.3	49'.0
15	236° 29'.6	5° 07'.7	59'.4	91° 27'.3	18'.7	126° 27'.2	05'.1	18° 01'.5	49'.1
16	251° 32'.1	20° 07'.3	21° 00'.3 S	106° 28'.3	18'.2	141° 29'.4	05'.1	33° 03'.7	49'.2
17	266° 34'.5	35° 06'.9	01'.1	121° 29'.2	17'.7	156° 31'.5	05'.1	48° 05'.9	49'.3
18	281° 37'.0	50° 06'.5	02'.0	136° 30'.2	17'.2	171° 33'.7	05'.1	63° 08'.1	49'.4
19	296° 39'.4	65° 06'.2	02'.8	151° 31'.2	16'.8	186° 35'.9	05'.0	78° 10'.3	49'.5
20	311° 41'.9	80° 05'.8	03'.7	166° 32'.1	16'.3	201° 38'.1	05'.0	93° 12'.5	49'.5
21	326° 44'.4	95° 05'.4	04'.5	181° 33'.1	15'.8	216° 40'.2	05'.0	108° 14'.7	49'.6
22	341° 46'.8	110° 05'.0	05'.4	196° 34'.0	15'.3	231° 42'.4	04'.9	123° 16'.9	49'.7
23	356° 49'.3	125° 04'.6	06'.2	211° 35'.0	14'.9	246° 44'.6	04'.9	138° 19'.1	49'.8
Thursday 3									
00	11° 51'.8	140° 04'.2	21° 07'.0 S	226° 36'.0	15° 14'.4 N	261° 46'.8	22° 04'.9 N	153° 21'.3	12° 49'.9 S
01	26° 54'.2	155° 03'.8	07'.9	241° 36'.9	13'.9	276° 49'.0	04'.8	168° 23'.5	50'.0
02	41° 56'.7	170° 03'.4	08'.7	256° 37'.9	13'.4	291° 51'.1	04'.8	183° 25'.7	50'.1
03	56° 59'.2	185° 03'.0	09'.6	271° 38'.9	13'.0	306° 53'.3	04'.8	198° 27'.9	50'.2
04	72° 01'.6	200° 02'.6	10'.4	286° 39'.8	12'.5	321° 55'.5	04'.7	213° 30'.1	50'.3
05	87° 04'.1	215° 02'.3	11'.2	301° 40'.8	12'.0	336° 57'.7	04'.7	228° 32'.3	50'.4
06	102° 06'.6	230° 01'.9	12'.1	316° 41'.8	11'.5	351° 59'.9	04'.7	243° 34'.5	50'.4
07	117° 09'.0	245° 01'.5	12'.9	331° 42'.7	11'.0	7° 02'.0	04'.6	258° 36'.7	50'.5
08	132° 11'.5	260° 01'.1	13'.8	346° 43'.7	10'.6	22° 04'.2	04'.6	273° 38'.9	50'.6
09	147° 13'.9	275° 00'.7	14'.6	1° 44'.6	10'.1	37° 06'.4	04'.6	288° 41'.1	50'.7
10	162° 16'.4	290° 00'.3	15'.4	16° 45'.6	09'.6	52° 08'.6	04'.5	303° 43'.3	50'.8
11	177° 18'.9	304° 59'.9	16'.3	31° 46'.6	09'.1	67° 10'.8	04'.5	318° 45'.5	50'.9
12	192° 21'.3	319° 59'.5	21° 17'.1 S	46° 47'.5	15° 08'.7 N	82° 12'.9	22° 04'.5 N	333° 47'.7	12° 51'.0 S
13	207° 23'.8	334° 59'.1	17'.9	61° 48'.5	08'.2	97° 15'.1	04'.4	348° 49'.9	51'.1
14	222° 26'.3	349° 58'.7	18'.8	76° 49'.5	07'.7	112° 17'.3	04'.4	3° 52'.1	51'.2
15	237° 28'.7	4° 58'.3	19'.6	91° 50'.4	07'.2	127° 19'.5	04'.4	18° 54'.3	51'.2
16	252° 31'.2	19° 57'.9	20'.4	106° 51'.4	06'.7	142° 21'.7	04'.3	33° 56'.5	51'.3
17	267° 33'.7	34° 57'.5	21'.2	121° 52'.4	06'.3	157° 23'.9	04'.3	48° 58'.7	51'.4
18	282° 36'.1	49° 57'.1	22'.1	136° 53'.3	05'.8	172° 26'.0	04'.3	64° 00'.9	51'.5
19	297° 38'.6	64° 56'.7	22'.9	151° 54'.3	05'.3	187° 28'.2	04'.3	79° 03'.1	51'.6
20	312° 41'.1	79° 56'.4	23'.7	166° 55'.3	04'.8	202° 30'.4	04'.2	94° 05'.3	51'.7
21	327° 43'.5	94° 56'.0	24'.5	181° 56'.2	04'.3	217° 32'.6	04'.2	109° 07'.5	51'.8
22	342° 46'.0	109° 55'.6	25'.4	196° 57'.2	03'.9	232° 34'.8	04'.2	124° 09'.7	51'.9
23	357° 48'.4	124° 55'.2	26'.2	211° 58'.2	03'.4	247° 37'.0	04'.1	139° 11'.9	52'.0
	M.P. 23:13	v -0'.4	d 0'.9	v 1'.0	d 0'.5	v 2'.2	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.9	40° 14'.8 S
Achernar	335° 26'.1	57° 09'.9 S
Acrux	173° 09'.7	63° 10'.5 S
Adhara	255° 12'.4	28° 59'.3 S
Aldebaran	290° 49'.0	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.2 N
Alkaid	152° 59'.2	49° 14'.8 N
Alnair	27° 43'.1	46° 53'.6 S
Alnilam	275° 46'.1	1° 11'.6 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 07'.9	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.0	69° 03'.2 S
Avior	234° 18'.2	59° 33'.1 S
Bellatrix	278° 31'.7	6° 21'.7 N
Betelgeuse	271° 01'.0	7° 24'.5 N
Canopus	263° 56'.0	52° 42'.0 S
Capella	280° 34'.0	46° 00'.4 N
Deneb	49° 31'.1	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.4 N
Elnath	278° 12'.2	28° 36'.9 N
Eltanin	90° 46'.1	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.4	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.4 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.4 S
Hamal	328° 00'.2	23° 31'.7 N
Kaus Aust.	83° 43'.6	34° 22'.6 S
Kochab	137° 21'.1	74° 06'.2 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.6	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.2 S
Miaplacidus	221° 40'.1	69° 46'.3 S
Mirfak	308° 39'.6	49° 54'.4 N
Nunki	75° 58'.0	26° 16'.6 S
Peacock	53° 18'.7	56° 41'.4 S
Polaris	317° 18'.0	89° 19'.2 N
Pollux	243° 27'.6	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.3 N
Rasalhague	96° 06'.4	12° 33'.4 N
Regulus	207° 43'.6	11° 53'.9 N
Rigel	281° 11'.7	8° 11'.1 S
Rigil Kent	139° 51'.9	60° 53'.5 S
Sabik	102° 12'.4	15° 44'.3 S
Schedar	349° 39'.6	56° 36'.9 N
Shaula	96° 21'.7	37° 06'.7 S
Sirius	258° 33'.5	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.5	43° 29'.2 S
Vega	80° 38'.8	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	129° 20'.9	14:39
Mars	215° 20'.3	08:55
Jupiter	250° 01'.9	06:35
Saturn	141° 35'.8	13:48

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
Tuesday 1							
00	182° 33'.9	3° 09'.9 S	228° 52'.2	13'.7	9° 53'.8 N	9'.0	55'.1
01	197° 34'.1	10'.9	243° 24'.9	13'.7	44'.8	9'.0	
02	212° 34'.3	11'.9	257° 57'.6	13'.7	35'.8	9'.1	
03	227° 34'.5	12'.8	272° 30'.3	13'.7	26'.7	9'.1	
04	242° 34'.7	13'.8	287° 03'.0	13'.7	17'.6	9'.2	55'.2
05	257° 34'.9	14'.8	301° 35'.7	13'.7	08'.4	9'.3	
06	272° 35'.1	15'.7	316° 08'.4	13'.7	8° 59'.1 N	9'.2	
07	287° 35'.3	16'.7	330° 41'.1	13'.7	49'.9	9'.4	
08	302° 35'.5	17'.7	345° 13'.8	13'.7	40'.5	9'.3	
09	317° 35'.7	18'.6	359° 46'.5	13'.7	31'.2	9'.4	55'.3
10	332° 35'.9	19'.6	14° 19'.2	13'.7	21'.8	9'.5	
11	347° 36'.1	20'.6	28° 51'.9	13'.7	12'.3	9'.5	
12	2° 36'.3	3° 21'.6 S	43° 24'.6	13'.7	8° 02'.8 N	9'.6	55'.3
13	17° 36'.5	22'.5	57° 57'.3	13'.7	7° 53'.2 N	9'.6	55'.4
14	32° 36'.7	23'.5	72° 30'.0	13'.7	43'.6	9'.6	
15	47° 36'.9	24'.5	87° 02'.7	13'.7	34'.0	9'.7	
16	62° 37'.1	25'.4	101° 35'.4	13'.7	24'.3	9'.7	
17	77° 37'.3	26'.4	116° 08'.1	13'.7	14'.6	9'.8	55'.5
18	92° 37'.5	27'.4	130° 40'.8	13'.6	04'.8	9'.8	
19	107° 37'.7	28'.3	145° 13'.4	13'.7	6° 55'.0 N	9'.8	
20	122° 37'.9	29'.3	159° 46'.1	13'.6	45'.2	9'.9	
21	137° 38'.1	30'.3	174° 18'.7	13'.7	35'.3	9'.9	
22	152° 38'.3	31'.2	188° 51'.4	13'.6	25'.4	10'.0	55'.6
23	167° 38'.5	32'.2	203° 24'.0	13'.7	15'.4	10'.0	
Wednesday 2							
00	182° 38'.7	3° 33'.2 S	217° 56'.7	13'.6	6° 05'.4 N	10'.0	55'.6
01	197° 38'.9	34'.1	232° 29'.3	13'.6	5° 55'.4 N	10'.1	
02	212° 39'.1	35'.1	247° 01'.9	13'.6	45'.3	10'.1	55'.7
03	227° 39'.3	36'.1	261° 34'.5	13'.6	35'.2	10'.1	
04	242° 39'.4	37'.0	276° 07'.1	13'.5	25'.1	10'.2	
05	257° 39'.6	38'.0	290° 39'.6	13'.6	14'.9	10'.2	
06	272° 39'.8	39'.0	305° 12'.2	13'.5	04'.7	10'.2	55'.8
07	287° 40'.0	40'.0	319° 44'.7	13'.6	4° 54'.5 N	10'.3	
08	302° 40'.2	40'.9	334° 17'.3	13'.5	44'.2	10'.3	
09	317° 40'.4	41'.9	348° 49'.8	13'.5	33'.9	10'.3	
10	332° 40'.6	42'.9	3° 22'.3	13'.5	23'.6	10'.4	55'.9
11	347° 40'.8	43'.8	17° 54'.8	13'.4	13'.2	10'.4	
12	2° 41'.0	3° 44'.8 S	32° 27'.2	13'.5	4° 02'.8 N	10'.4	55'.9
13	17° 41'.2	45'.8	46° 59'.7	13'.4	3° 52'.4 N	10'.4	
14	32° 41'.4	46'.7	61° 32'.1	13'.5	42'.0	10'.5	56'.0
15	47° 41'.6	47'.7	76° 04'.6	13'.4	31'.5	10'.5	
16	62° 41'.8	48'.7	90° 37'.0	13'.3	21'.0	10'.5	
17	77° 42'.0	49'.6	105° 09'.3	13'.4	10'.5	10'.6	
18	92° 42'.2	50'.6	119° 41'.7	13'.3	2° 59'.9 N	10'.5	56'.1
19	107° 42'.4	51'.6	134° 14'.0	13'.4	49'.4	10'.6	
20	122° 42'.6	52'.5	148° 46'.4	13'.3	38'.8	10'.7	
21	137° 42'.8	53'.5	163° 18'.7	13'.2	28'.1	10'.6	
22	152° 43'.0	54'.5	177° 50'.9	13'.3	17'.5	10'.7	56'.2
23	167° 43'.2	55'.4	192° 23'.2	13'.2	06'.8	10'.7	
Thursday 3							
00	182° 43'.4	3° 56'.4 S	206° 55'.4	13'.2	1° 56'.1 N	10'.7	56'.2
01	197° 43'.6	57'.4	221° 27'.6	13'.2	45'.4	10'.7	56'.3
02	212° 43'.8	58'.3	235° 59'.8	13'.2	34'.7	10'.7	
03	227° 44'.0	59'.3	250° 32'.0	13'.1	24'.0	10'.8	
04	242° 44'.2	4° 00'.3 S	265° 04'.1	13'.1	13'.2	10'.7	
05	257° 44'.3	01'.2	279° 36'.2	13'.1	02'.5	10'.8	56'.4
06	272° 44'.5	02'.2	294° 08'.3	13'.1	0° 51'.7 N	10'.8	
07	287° 44'.7	03'.2	308° 40'.4	13'.0	40'.9	10'.9	
08	302° 44'.9	04'.1	323° 12'.4	13'.0	30'.0	10'.8	
09	317° 45'.1	05'.1	337° 44'.4	12'.9	19'.2	10'.8	56'.5
10	332° 45'.3	06'.1	352° 16'.3	13'.0	08'.4	10'.9	
11	347° 45'.5	07'.0	6° 48'.3	12'.9	0° 02'.5 S	10'.8	
12	2° 45'.7	4° 08'.0 S	21° 20'.2	12'.9	0° 13'.3 S	10'.9	56'.5
13	17° 45'.9	09'.0	35° 52'.1	12'.8	24'.2	10'.9	56'.6
14	32° 46'.1	09'.9	50° 23'.9	12'.8	35'.1	10'.9	
15	47° 46'.3	10'.9	64° 55'.7	12'.8	46'.0	10'.9	
16	62° 46'.5	11'.8	79° 27'.5	12'.7	56'.9	10'.9	
17	77° 46'.7	12'.8	93° 59'.2	12'.8	1° 07'.8 S	10'.9	56'.7
18	92° 46'.9	13'.8	108° 31'.0	12'.6	18'.7	10'.9	
19	107° 47'.1	14'.7	123° 02'.6	12'.7	29'.6	10'.9	
20	122° 47'.2	15'.7	137° 34'.3	12'.6	40'.5	10'.9	56'.8
21	137° 47'.4	16'.7	152° 05'.9	12'.5	51'.4	10'.9	
22	152° 47'.6	17'.6	166° 37'.4	12'.6	2° 02'.3 S	11'.0	
23	167° 47'.8	18'.6	181° 09'.0	12'.5	13'.3	10'.9	
	SD 16'.0	d 1'.0	SD	15'.1	15'.2	15'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 1	Moonrise 2	Moonrise 3
N 72°	03:55	05:16	06:24	00:39	02:23	04:07
N 70°	04:06	05:19	06:20	00:55	02:31	04:08
68°	04:15	05:21	06:17	01:07	02:38	04:09
66°	04:23	05:23	06:14	01:18	02:43	04:11
64°	04:29	05:24	06:12	01:26	02:48	04:11
62°	04:34	05:26	06:10	01:34	02:52	04:12
60°	04:38	05:27	06:08	01:40	02:55	04:13
N 58°	04:42	05:27	06:06	01:45	02:58	04:13
56°	04:45	05:28	06:05	01:50	03:01	04:14
54°	04:47	05:29	06:04	01:55	03:04	04:14
52°	04:50	05:29	06:03	01:59	03:06	04:15
50°	04:52	05:29	06:02	02:02	03:08	04:15
45°	04:56	05:30	05:59	02:10	03:12	04:16
N 40°	04:59	05:30	05:57	02:17	03:16	04:17
35°	05:01	05:30	05:56	02:22	03:19	04:18
30°	05:02	05:30	05:54	02:27	03:22	04:18
20°	05:04	05:29	05:51	02:36	03:27	04:19
N 10°	05:03	05:28	05:49	02:43	03:31	04:20
0°	05:01	05:25	05:46	02:50	03:35	04:21
S 10°	04:58	05:22	05:43	02:57	03:39	04:22
20°	04:53	05:18	05:40	03:04	03:43	04:23
30°	04:45	05:13	05:37	03:13	03:48	04:24
35°	04:40	05:10	05:35	03:18	03:51	04:24
40°	04:33	05:06	05:33	03:23	03:54	04:25
45°	04:25	05:00	05:30	03:29	03:58	04:26
S 50°	04:15	04:54	05:27	03:37	04:02	04:27
52°	04:10	04:51	05:25	03:41	04:04	04:27
54°	04:05	04:48	05:24	03:44	04:06	04:28
56°	03:58	04:44	05:22	03:49	04:09	04:28
58°	03:51	04:40	05:20	03:53	04:11	04:29
S 60°	03:42	04:35	05:17	03:59	04:14	04:29
S 62°	03:32	04:29	05:15	04:04	04:18	04:30

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 1	Moonset 2	Moonset 3
N 72°	17:13	18:20	19:40	16:46	16:37	16:29
N 70°	17:17	18:17	19:29	16:36	16:33	16:30
68°	17:20	18:15	19:21	16:28	16:30	16:32
66°	17:23	18:14	19:14	16:21	16:27	16:33
64°	17:25	18:12	19:08	16:15	16:24	16:34
62°	17:27	18:11	19:03	16:09	16:22	16:34
60°	17:29	18:11	18:59	16:05	16:20	16:35
N 58°	17:31	18:10	18:55	16:01	16:18	16:36
56°	17:32	18:09	18:52	15:57	16:17	16:36
54°	17:34	18:09	18:50	15:54	16:15	16:37
52°	17:35	18:08	18:48	15:51	16:14	16:37
50°	17:36	18:08	18:46	15:48	16:13	16:38
45°	17:39	18:08	18:42	15:43	16:11	16:38
N 40°	17:41	18:08	18:39	15:38	16:08	16:39
35°	17:43	18:08	18:37	15:33	16:07	16:40
30°	17:44	18:08	18:36	15:30	16:05	16:40
20°	17:47	18:09	18:35	15:23	16:02	16:41
N 10°	17:50	18:11	18:35	15:17	15:59	16:42
0°	17:53	18:13	18:37	15:12	15:57	16:43
S 10°	17:55	18:16	18:41	15:06	15:55	16:44
20°	17:58	18:20	18:46	15:00	15:52	16:45
30°	18:02	18:26	18:54	14:53	15:49	16:46
35°	18:04	18:30	18:59	14:50	15:47	16:46
40°	18:06	18:34	19:06	14:45	15:45	16:47
45°	18:09	18:39	19:14	14:40	15:43	16:47
S 50°	18:13	18:46	19:25	14:34	15:40	16:48
52°	18:14	18:49	19:30	14:31	15:39	16:49
54°	18:16	18:52	19:36	14:27	15:37	16:49
56°	18:18	18:56	19:42	14:24	15:36	16:49
58°	18:20	19:00	19:50	14:20	15:34	16:50
S 60°	18:23	19:05	19:58	14:16	15:32	16:50
S 62°	18:25	19:11	20:09	14:10	15:30	16:51

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
1	10 15	10 25	11:50	09:01	21:23	26d 13%
2	10 34	10 44	11:49	09:46	22:09	27d 7%
3	10 53	11 02	11:49	10:32	22:55	28d 3%

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2013 October 4, 5, 6 (Fri, Sat, Sun)

GMT	ARIES	VENUS -4.2		MARS +1.6		JUPITER -2.2		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
4 Friday 00	12° 50'.9	139° 54'.8	21° 27'.0 S	226° 59'.1	15° 02'.9 N	262° 39'.2	22° 04'.1 N	154° 14'.1	12° 52'.1 S
01	27° 53'.4	154° 54'.4	27'.8	242° 00'.1	02'.4	277° 41'.3	04'.1	169° 16'.3	52'.1
02	42° 55'.8	169° 54'.0	28'.7	257° 01'.1	01'.9	292° 43'.5	04'.0	184° 18'.5	52'.2
03	57° 58'.3	184° 53'.6	29'.5	272° 02'.0	01'.5	307° 45'.7	04'.0	199° 20'.7	52'.3
04	73° 00'.8	199° 53'.2	30'.3	287° 03'.0	01'.0	322° 47'.9	04'.0	214° 22'.9	52'.4
05	88° 03'.2	214° 52'.8	31'.1	302° 04'.0	00'.5	337° 50'.1	03'.9	229° 25'.1	52'.5
06	103° 05'.7	229° 52'.4	31'.9	317° 04'.9	00'.0	352° 52'.3	03'.9	244° 27'.3	52'.6
07	118° 08'.2	244° 52'.0	32'.7	332° 05'.9	14° 59'.5 N	7° 54'.5	03'.9	259° 29'.5	52'.7
08	133° 10'.6	259° 51'.6	33'.6	347° 06'.9	59'.1	22° 56'.7	03'.8	274° 31'.7	52'.8
09	148° 13'.1	274° 51'.2	34'.4	2° 07'.9	58'.6	37° 58'.8	03'.8	289° 33'.9	52'.9
10	163° 15'.5	289° 50'.8	35'.2	17° 08'.8	58'.1	53° 01'.0	03'.8	304° 36'.1	53'.0
11	178° 18'.0	304° 50'.4	36'.0	32° 09'.8	57'.6	68° 03'.2	03'.8	319° 38'.3	53'.0
12	193° 20'.5	319° 50'.0	21° 36'.8 S	47° 10'.8	14° 57'.1 N	83° 05'.4	22° 03'.7 N	334° 40'.5	12° 53'.1 S
13	208° 22'.9	334° 49'.6	37'.6	62° 11'.7	56'.7	98° 07'.6	03'.7	349° 42'.7	53'.2
14	223° 25'.4	349° 49'.2	38'.4	77° 12'.7	56'.2	113° 09'.8	03'.7	4° 44'.9	53'.3
15	238° 27'.9	4° 48'.8	39'.2	92° 13'.7	55'.7	128° 12'.0	03'.6	19° 47'.1	53'.4
16	253° 30'.3	19° 48'.4	40'.1	107° 14'.6	55'.2	143° 14'.2	03'.6	34° 49'.3	53'.5
17	268° 32'.8	34° 48'.0	40'.9	122° 15'.6	54'.7	158° 16'.4	03'.6	49° 51'.5	53'.6
18	283° 35'.3	49° 47'.6	41'.7	137° 16'.6	54'.2	173° 18'.5	03'.5	64° 53'.7	53'.7
19	298° 37'.7	64° 47'.2	42'.5	152° 17'.6	53'.8	188° 20'.7	03'.5	79° 55'.8	53'.8
20	313° 40'.2	79° 46'.8	43'.3	167° 18'.5	53'.3	203° 22'.9	03'.5	94° 58'.0	53'.9
21	328° 42'.7	94° 46'.4	44'.1	182° 19'.5	52'.8	218° 25'.1	03'.4	110° 00'.2	53'.9
22	343° 45'.1	109° 46'.0	44'.9	197° 20'.5	52'.3	233° 27'.3	03'.4	125° 02'.4	54'.0
23	358° 47'.6	124° 45'.6	45'.7	212° 21'.4	51'.8	248° 29'.5	03'.4	140° 04'.6	54'.1
5 Saturday 00	13° 50'.0	139° 45'.2	21° 46'.5 S	227° 22'.4	14° 51'.4 N	263° 31'.7	22° 03'.3 N	155° 06'.8	12° 54'.2 S
01	28° 52'.5	154° 44'.8	47'.3	242° 23'.4	50'.9	278° 33'.9	03'.3	170° 09'.0	54'.3
02	43° 55'.0	169° 44'.4	48'.1	257° 24'.4	50'.4	293° 36'.1	03'.3	185° 11'.2	54'.4
03	58° 57'.4	184° 44'.0	48'.9	272° 25'.3	49'.9	308° 38'.3	03'.3	200° 13'.4	54'.5
04	73° 59'.9	199° 43'.6	49'.7	287° 26'.3	49'.4	323° 40'.5	03'.2	215° 15'.6	54'.6
05	89° 02'.4	214° 43'.2	50'.5	302° 27'.3	48'.9	338° 42'.7	03'.2	230° 17'.8	54'.7
06	104° 04'.8	229° 42'.8	51'.3	317° 28'.3	48'.5	353° 44'.9	03'.2	245° 20'.0	54'.8
07	119° 07'.3	244° 42'.3	52'.1	332° 29'.2	48'.0	8° 47'.1	03'.1	260° 22'.2	54'.9
08	134° 09'.8	259° 41'.9	52'.9	347° 30'.2	47'.5	23° 49'.3	03'.1	275° 24'.4	54'.9
09	149° 12'.2	274° 41'.5	53'.7	2° 31'.2	47'.0	38° 51'.5	03'.1	290° 26'.6	55'.0
10	164° 14'.7	289° 41'.1	54'.5	17° 32'.2	46'.5	53° 53'.6	03'.0	305° 28'.8	55'.1
11	179° 17'.1	304° 40'.7	55'.2	32° 33'.1	46'.0	68° 55'.8	03'.0	320° 31'.0	55'.2
12	194° 19'.6	319° 40'.3	21° 56'.0 S	47° 34'.1	14° 45'.6 N	83° 58'.0	22° 03'.0 N	335° 33'.2	12° 55'.3 S
13	209° 22'.1	334° 39'.9	56'.8	62° 35'.1	45'.1	99° 00'.2	03'.0	350° 35'.4	55'.4
14	224° 24'.5	349° 39'.5	57'.6	77° 36'.1	44'.6	114° 02'.4	02'.9	5° 37'.6	55'.5
15	239° 27'.0	4° 39'.1	58'.4	92° 37'.0	44'.1	129° 04'.6	02'.9	20° 39'.8	55'.6
16	254° 29'.5	19° 38'.7	59'.2	107° 38'.0	43'.6	144° 06'.8	02'.9	35° 42'.0	55'.7
17	269° 31'.9	34° 38'.3	22° 00'.0 S	122° 39'.0	43'.1	159° 09'.0	02'.8	50° 44'.2	55'.8
18	284° 34'.4	49° 37'.9	00'.8	137° 40'.0	42'.6	174° 11'.2	02'.8	65° 46'.4	55'.8
19	299° 36'.9	64° 37'.5	01'.6	152° 40'.9	42'.2	189° 13'.4	02'.8	80° 48'.6	55'.9
20	314° 39'.3	79° 37'.1	02'.3	167° 41'.9	41'.7	204° 15'.6	02'.7	95° 50'.8	56'.0
21	329° 41'.8	94° 36'.7	03'.1	182° 42'.9	41'.2	219° 17'.8	02'.7	110° 53'.0	56'.1
22	344° 44'.3	109° 36'.3	03'.9	197° 43'.9	40'.7	234° 20'.0	02'.7	125° 55'.2	56'.2
23	359° 46'.7	124° 35'.8	04'.7	212° 44'.8	40'.2	249° 22'.2	02'.7	140° 57'.3	56'.3
6 Sunday 00	14° 49'.2	139° 35'.4	22° 05'.5 S	227° 45'.8	14° 39'.7 N	264° 24'.4	22° 02'.6 N	155° 59'.5	12° 56'.4 S
01	29° 51'.6	154° 35'.0	06'.2	242° 46'.8	39'.3	279° 26'.6	02'.6	171° 01'.7	56'.5
02	44° 54'.1	169° 34'.6	07'.0	257° 47'.8	38'.8	294° 28'.8	02'.6	186° 03'.9	56'.6
03	59° 56'.6	184° 34'.2	07'.8	272° 48'.7	38'.3	309° 31'.0	02'.5	201° 06'.1	56'.7
04	74° 59'.0	199° 33'.8	08'.6	287° 49'.7	37'.8	324° 33'.2	02'.5	216° 08'.3	56'.7
05	90° 01'.5	214° 33'.4	09'.4	302° 50'.7	37'.3	339° 35'.4	02'.5	231° 10'.5	56'.8
06	105° 04'.0	229° 33'.0	10'.1	317° 51'.7	36'.8	354° 37'.6	02'.4	246° 12'.7	56'.9
07	120° 06'.4	244° 32'.6	10'.9	332° 52'.7	36'.3	9° 39'.8	02'.4	261° 14'.9	57'.0
08	135° 08'.9	259° 32'.2	11'.7	347° 53'.6	35'.9	24° 42'.0	02'.4	276° 17'.1	57'.1
09	150° 11'.4	274° 31'.8	12'.5	2° 54'.6	35'.4	39° 44'.2	02'.4	291° 19'.3	57'.2
10	165° 13'.8	289° 31'.3	13'.2	17° 55'.6	34'.9	54° 46'.4	02'.3	306° 21'.5	57'.3
11	180° 16'.3	304° 30'.9	14'.0	32° 56'.6	34'.4	69° 48'.6	02'.3	321° 23'.7	57'.4
12	195° 18'.7	319° 30'.5	22° 14'.8 S	47° 57'.6	14° 33'.9 N	84° 50'.8	22° 02'.3 N	336° 25'.9	12° 57'.5 S
13	210° 21'.2	334° 30'.1	15'.5	62° 58'.5	33'.4	99° 53'.0	02'.2	351° 28'.1	57'.6
14	225° 23'.7	349° 29'.7	16'.3	77° 59'.5	32'.9	114° 55'.2	02'.2	6° 30'.3	57'.7
15	240° 26'.1	4° 29'.3	17'.1	93° 00'.5	32'.4	129° 57'.5	02'.2	21° 32'.5	57'.7
16	255° 28'.6	19° 28'.9	17'.8	108° 01'.5	32'.0	144° 59'.7	02'.1	36° 34'.7	57'.8
17	270° 31'.1	34° 28'.5	18'.6	123° 02'.5	31'.5	160° 01'.9	02'.1	51° 36'.9	57'.9
18	285° 33'.5	49° 28'.1	19'.4	138° 03'.4	31'.0	175° 04'.1	02'.1	66° 39'.1	58'.0
19	300° 36'.0	64° 27'.6	20'.1	153° 04'.4	30'.5	190° 06'.3	02'.1	81° 41'.2	58'.1
20	315° 38'.5	79° 27'.2	20'.9	168° 05'.4	30'.0	205° 08'.5	02'.0	96° 43'.4	58'.2
21	330° 40'.9	94° 26'.8	21'.7	183° 06'.4	29'.5	220° 10'.7	02'.0	111° 45'.6	58'.3
22	345° 43'.4	109° 26'.4	22'.4	198° 07'.4	29'.0	235° 12'.9	02'.0	126° 47'.8	58'.4
23	0° 45'.9	124° 26'.0	23'.2	213° 08'.4	28'.5	250° 15'.1	01'.9	141° 50'.0	58'.5
	M.P. 23:01	v -0'.4	d 0'.8	v 1'.0	d 0'.5	v 2'.2	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.8	40° 14'.8 S
Achernar	335° 26'.1	57° 09'.9 S
Acrux	173° 09'.7	63° 10'.5 S
Adhara	255° 12'.4	28° 59'.3 S
Aldebaran	290° 48'.9	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.2 N
Alkaid	152° 59'.2	49° 14'.8 N
Alnair	27° 43'.2	46° 53'.6 S
Alnilam	275° 46'.1	1° 11'.6 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 08'.0	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.1	69° 03'.2 S
Avior	234° 18'.1	59° 33'.1 S
Bellatrix	278° 31'.7	6° 21'.7 N
Betelgeuse	271° 01'.0	7° 24'.5 N
Canopus	263° 56'.0	52° 42'.0 S
Capella	280° 33'.9	46° 00'.4 N
Deneb	49° 31'.1	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.4 N
Elnath	278° 12'.2	28° 36'.9 N
Eltanin	90° 46'.2	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.4 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.3 S
Hamal	328° 00'.2	23° 31'.7 N
Kaus Aust.	83° 43'.6	34° 22'.6 S
Kochab	137° 21'.1	74° 06'.2 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.6	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.2 S
Miaplacidus	221° 40'.1	69° 46'.3 S
Mirfak	308° 39'.6	49° 54'.4 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 18'.7	56° 41'.4 S
Polaris	317° 17'.1	89° 19'.2 N
Pollux	243° 27'.6	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.3 N
Rasalhague	96° 06'.4	12° 33'.4 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 11'.7	8° 11'.1 S
Rigil Kent	139° 51'.9	60° 53'.5 S
Sabik	102° 12'.4	15° 44'.3 S
Schedar	349° 39'.6	56° 36'.9 N
Shaula	96° 21'.8	37° 06'.7 S
Sirius	258° 33'.5	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.5	43° 29'.2 S
Vega	80° 38'.8	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	125° 55'.1	14:41
Mars	213° 32'.4	08:50
Jupiter	249° 41'.7	06:25
Saturn	141° 16'.8	13:38

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
4 Friday 00	182° 48'.0	4° 19'.6 S	195° 40'.5	12'.4	2° 24'.2 S	10'.9	56'.9
01	197° 48'.2	20'.5	210° 11'.9	12'.4	35'.1	10'.9	
02	212° 48'.4	21'.5	224° 43'.3	12'.4	46'.0	10'.9	
03	227° 48'.6	22'.5	239° 14'.7	12'.4	56'.9	10'.9	
04	242° 48'.8	23'.4	253° 46'.1	12'.3	3° 07'.8 S	10'.9	57'.0
05	257° 49'.0	24'.4	268° 17'.4	12'.2	18'.7	10'.9	
06	272° 49'.2	25'.3	282° 48'.6	12'.2	29'.6	10'.9	
07	287° 49'.3	26'.3	297° 19'.8	12'.2	40'.5	10'.9	
08	302° 49'.5	27'.3	311° 51'.0	12'.1	51'.4	10'.9	57'.1
09	317° 49'.7	28'.2	326° 22'.1	12'.1	4° 02'.3 S	10'.8	
10	332° 49'.9	29'.2	340° 53'.2	12'.1	13'.1	10'.9	
11	347° 50'.1	30'.2	355° 24'.3	12'.0	24'.0	10'.8	
12	2° 50'.3	4° 31'.1 S	9° 55'.3	11'.9	4° 34'.8 S	10'.8	57'.2
13	17° 50'.5	32'.1	24° 26'.2	11'.9	45'.6	10'.8	
14	32° 50'.7	33'.1	38° 57'.1	11'.9	56'.4	10'.8	
15	47° 50'.9	34'.0	53° 28'.0	11'.8	5° 07'.2 S	10'.8	57'.3
16	62° 51'.1	35'.0	67° 58'.8	11'.8	18'.0	10'.8	
17	77° 51'.2	35'.9	82° 29'.6	11'.7	28'.8	10'.7	
18	92° 51'.4	36'.9	97° 00'.3	11'.7	39'.5	10'.7	
19	107° 51'.6	37'.9	111° 31'.0	11'.6	50'.2	10'.7	57'.4
20	122° 51'.8	38'.8	126° 01'.6	11'.6	6° 00'.9 S	10'.7	
21	137° 52'.0	39'.8	140° 32'.2	11'.5	11'.6	10'.7	
22	152° 52'.2	40'.8	155° 02'.7	11'.5	22'.3	10'.6	
23	167° 52'.4	41'.7	169° 33'.2	11'.4	32'.9	10'.6	57'.5
5 Saturday 00	182° 52'.6	4° 42'.7 S	184° 03'.6	11'.4	6° 43'.5 S	10'.6	57'.5
01	197° 52'.7	43'.6	198° 34'.0	11'.3	54'.1	10'.6	
02	212° 52'.9	44'.6	213° 04'.3	11'.3	7° 04'.7 S	10'.5	
03	227° 53'.1	45'.6	227° 34'.6	11'.2	15'.2	10'.5	57'.6
04	242° 53'.3	46'.5	242° 04'.8	11'.1	25'.7	10'.5	
05	257° 53'.5	47'.5	256° 34'.9	11'.1	36'.2	10'.4	
06	272° 53'.7	48'.5	271° 05'.0	11'.1	46'.6	10'.4	
07	287° 53'.9	49'.4	285° 35'.1	11'.0	57'.0	10'.4	
08	302° 54'.1	50'.4	300° 05'.1	11'.0	8° 07'.4 S	10'.3	57'.7
09	317° 54'.2	51'.3	314° 35'.1	10'.8	17'.7	10'.3	
10	332° 54'.4	52'.3	329° 04'.9	10'.9	28'.0	10'.3	
11	347° 54'.6	53'.3	343° 34'.8	10'.8	38'.3	10'.2	
12	2° 54'.8	4° 54'.2 S	358° 04'.6	10'.7	8° 48'.5 S	10'.2	57'.8
13	17° 55'.0	55'.2	12° 34'.3	10'.7	58'.7	10'.1	
14	32° 55'.2	56'.1	27° 04'.0	10'.6	9° 08'.8 S	10'.1	
15	47° 55'.4	57'.1	41° 33'.6	10'.5	18'.9	10'.1	
16	62° 55'.5	58'.1	56° 03'.1	10'.5	29'.0	10'.0	57'.9
17	77° 55'.7	59'.0	70° 32'.6	10'.5	39'.0	10'.0	
18	92° 55'.9	00'.0	85° 02'.1	10'.4	49'.0	9'.9	
19	107° 56'.1	5° 00'.9 S	99° 31'.5	10'.3	58'.9	9'.9	
20	122° 56'.3	01'.9	114° 00'.8	10'.2	10° 08'.8 S	9'.8	
21	137° 56'.5	02'.9	128° 30'.0	10'.3	18'.6	9'.8	58'.0
22	152° 56'.6	03'.8	142° 59'.3	10'.1	28'.4	9'.8	
23	167° 56'.8	04'.8	157° 28'.4	10'.1	38'.2	9'.6	
6 Sunday 00	182° 57'.0	5° 05'.7 S	171° 57'.5	10'.0	10° 47'.8 S	9'.7	58'.0
01	197° 57'.2	06'.7	186° 26'.5	10'.0	57'.5	9'.5	58'.1
02	212° 57'.4	07'.7	200° 55'.5	9'.9	11° 07'.0 S	9'.6	
03	227° 57'.6	08'.6	215° 24'.4	9'.8	16'.6	9'.4	
04	242° 57'.7	09'.6	229° 53'.2	9'.8	26'.0	9'.4	
05	257° 57'.9	10'.5	244° 22'.0	9'.8	35'.4	9'.4	
06	272° 58'.1	11'.5	258° 50'.8	9'.6	44'.8	9'.3	58'.2
07	287° 58'.3	12'.5	273° 19'.4	9'.6	54'.1	9'.2	
08	302° 58'.5	13'.4	287° 48'.0	9'.6	12° 03'.3 S	9'.1	
09	317° 58'.7	14'.4	302° 16'.6	9'.5	12'.4	9'.1	
10	332° 58'.8	15'.3	316° 45'.1	9'.4	21'.5	9'.1	
11	347° 59'.0	16'.3	331° 13'.5	9'.3	30'.6	8'.9	58'.3
12	2° 59'.2	5° 17'.3 S	345° 41'.8	9'.3	12° 39'.5 S	8'.9	58'.3
13	17° 59'.4	18'.2	0° 10'.1	9'.3	48'.4	8'.9	
14	32° 59'.6	19'.2	14° 38'.4	9'.2	57'.3	8'.7	
15	47° 59'.8	20'.1	29° 06'.6	9'.1	13° 06'.0 S	8'.7	
16	62° 59'.9	21'.1	43° 34'.7	9'.0	14'.7	8'.7	58'.4
17	78° 00'.1	22'.0	58° 02'.7	9'.0	23'.4	8'.5	
18	93° 00'.3	23'.0	72° 30'.7	8'.9	31'.9	8'.5	
19	108° 00'.5	24'.0	86° 58'.6	8'.9	40'.4	8'.4	
20	123° 00'.7	24'.9	101° 26'.5	8'.8	48'.8	8'.3	
21	138° 00'.8	25'.9	115° 54'.3	8'.8	57'.1	8'.2	58'.5
22	153° 01'.0	26'.8	130° 22'.1	8'.7	14° 05'.3 S	8'.2	
23	168° 01'.2	27'.8	144° 49'.8	8'.6	13'.5	8'.1	
	SD 16'.0	d 1'.0	SD	15'.6	15'.7	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 4	Moonrise 5	Moonrise 6
N 72°	04:10	05:30	06:37	05:53	07:45	09:44
N 70°	04:19	05:31	06:32	05:48	07:32	09:20
68°	04:27	05:32	06:27	05:44	07:21	09:02
66°	04:33	05:33	06:24	05:40	07:13	08:48
64°	04:38	05:33	06:20	05:37	07:06	08:36
62°	04:42	05:33	06:18	05:35	07:00	08:26
60°	04:45	05:34	06:15	05:33	06:54	08:18
N 58°	04:48	05:34	06:13	05:31	06:50	08:10
56°	04:51	05:34	06:11	05:29	06:46	08:04
54°	04:53	05:34	06:09	05:27	06:42	07:58
52°	04:55	05:34	06:08	05:26	06:39	07:53
50°	04:56	05:34	06:06	05:25	06:36	07:48
45°	05:00	05:34	06:03	05:22	06:29	07:38
N 40°	05:02	05:33	06:00	05:19	06:24	07:30
35°	05:03	05:33	05:58	05:17	06:19	07:22
30°	05:04	05:32	05:56	05:16	06:15	07:16
20°	05:04	05:30	05:52	05:13	06:08	07:05
N 10°	05:03	05:27	05:48	05:10	06:02	06:56
0°	05:00	05:24	05:45	05:08	05:56	06:47
S 10°	04:56	05:21	05:42	05:05	05:50	06:38
20°	04:50	05:16	05:38	05:03	05:44	06:29
30°	04:41	05:09	05:33	05:00	05:38	06:18
35°	04:35	05:05	05:31	04:58	05:34	06:12
40°	04:28	05:01	05:28	04:56	05:29	06:05
45°	04:19	04:55	05:24	04:54	05:24	05:57
S 50°	04:08	04:47	05:20	04:52	05:18	05:48
52°	04:03	04:44	05:18	04:51	05:15	05:43
54°	03:56	04:40	05:16	04:49	05:12	05:39
56°	03:49	04:36	05:14	04:48	05:09	05:33
58°	03:41	04:31	05:11	04:46	05:05	05:27
S 60°	03:32	04:25	05:08	04:45	05:01	05:21
S 62°	03:21	04:19	05:05	04:43	04:57	05:13

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 4	Moonset 5	Moonset 6
N 72°	16:57	18:04	19:24	16:20	16:10	15:57
N 70°	17:03	18:04	19:15	16:27	16:25	16:22
68°	17:08	18:03	19:08	16:34	16:37	16:41
66°	17:11	18:02	19:02	16:39	16:46	16:57
64°	17:15	18:02	18:57	16:43	16:55	17:10
62°	17:18	18:02	18:53	16:47	17:02	17:20
60°	17:20	18:02	18:50	16:51	17:08	17:30
N 58°	17:23	18:02	18:47	16:54	17:14	17:38
56°	17:25	18:02	18:45	16:56	17:19	17:45
54°	17:26	18:02	18:42	16:59	17:23	17:51
52°	17:28	18:02	18:41	17:01	17:27	17:57
50°	17:30	18:02	18:39	17:03	17:31	18:02
45°	17:33	18:02	18:36	17:07	17:39	18:14
N 40°	17:36	18:03	18:34	17:11	17:45	18:23
35°	17:38	18:04	18:33	17:14	17:51	18:31
30°	17:41	18:04	18:32	17:17	17:56	18:38
20°	17:45	18:07	18:32	17:22	18:05	18:51
N 10°	17:48	18:09	18:34	17:26	18:13	19:02
0°	17:52	18:12	18:36	17:31	18:20	19:12
S 10°	17:55	18:16	18:41	17:35	18:27	19:22
20°	17:59	18:21	18:47	17:39	18:35	19:33
30°	18:04	18:28	18:56	17:44	18:44	19:46
35°	18:06	18:32	19:02	17:47	18:49	19:53
40°	18:10	18:37	19:09	17:50	18:55	20:01
45°	18:13	18:43	19:18	17:54	19:02	20:11
S 50°	18:17	18:50	19:30	17:58	19:10	20:23
52°	18:19	18:54	19:36	18:00	19:14	20:28
54°	18:22	18:58	19:42	18:03	19:18	20:34
56°	18:24	19:02	19:49	18:05	19:23	20:41
58°	18:27	19:07	19:58	18:08	19:28	20:48
S 60°	18:30	19:13	20:07	18:11	19:34	20:57
S 62°	18:33	19:20	20:19	18:15	19:40	21:07

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
4	11 12	11 21	11:49	11:19	23:43	29d 0%
5	11 30	11 39	11:48	12:08	24:33	0d 0%
6	11 48	11 56	11:48	12:59	00:33	1d 3%

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2013 October 7, 8, 9 (Mon, Tue, Wed)

GMT	ARIES	VENUS -4.2		MARS +1.6		JUPITER -2.2		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
7 Monday 00	15° 48'.3	139° 25'.6	22° 23'.9 S	228° 09'.3	14° 28'.1 N	265° 17'.3	22° 01'.9 N	156° 52'.2	12° 58'.6 S
01	30° 50'.8	154° 25'.2	24'.7	243° 10'.3	27'.6	280° 19'.5	01'.9	171° 54'.4	58'.6
02	45° 53'.2	169° 24'.7	25'.4	258° 11'.3	27'.1	295° 21'.7	01'.9	186° 56'.6	58'.7
03	60° 55'.7	184° 24'.3	26'.2	273° 12'.3	26'.6	310° 23'.9	01'.8	201° 58'.8	58'.8
04	75° 58'.2	199° 23'.9	27'.0	288° 13'.3	26'.1	325° 26'.1	01'.8	217° 01'.0	58'.9
05	91° 00'.6	214° 23'.5	27'.7	303° 14'.2	25'.6	340° 28'.3	01'.8	232° 03'.2	59'.0
06	106° 03'.1	229° 23'.1	28'.5	318° 15'.2	25'.1	355° 30'.6	01'.7	247° 05'.4	59'.1
07	121° 05'.6	244° 22'.7	29'.2	333° 16'.2	24'.6	10° 32'.8	01'.7	262° 07'.6	59'.2
08	136° 08'.0	259° 22'.3	30'.0	348° 17'.2	24'.2	25° 35'.0	01'.7	277° 09'.8	59'.3
09	151° 10'.5	274° 21'.8	30'.7	3° 18'.2	23'.7	40° 37'.2	01'.7	292° 12'.0	59'.4
10	166° 13'.0	289° 21'.4	31'.5	18° 19'.2	23'.2	55° 39'.4	01'.6	307° 14'.2	59'.5
11	181° 15'.4	304° 21'.0	32'.2	33° 20'.2	22'.7	70° 41'.6	01'.6	322° 16'.3	59'.6
12	196° 17'.9	319° 20'.6	22° 33'.0 S	48° 21'.1	14° 22'.2 N	85° 43'.8	22° 01'.6 N	337° 18'.5	12° 59'.6 S
13	211° 20'.4	334° 20'.2	33'.7	63° 22'.1	21'.7	100° 46'.0	01'.5	352° 20'.7	59'.7
14	226° 22'.8	349° 19'.8	34'.5	78° 23'.1	21'.2	115° 48'.2	01'.5	7° 22'.9	59'.8
15	241° 25'.3	4° 19'.3	35'.2	93° 24'.1	20'.7	130° 50'.5	01'.5	22° 25'.1	59'.9
16	256° 27'.7	19° 18'.9	36'.0	108° 25'.1	20'.2	145° 52'.7	01'.4	37° 27'.3	13° 00'.0 S
17	271° 30'.2	34° 18'.5	36'.7	123° 26'.1	19'.8	160° 54'.9	01'.4	52° 29'.5	00'.1
18	286° 32'.7	49° 18'.1	37'.4	138° 27'.1	19'.3	175° 57'.1	01'.4	67° 31'.7	00'.2
19	301° 35'.1	64° 17'.7	38'.2	153° 28'.0	18'.8	190° 59'.3	01'.4	82° 33'.9	00'.3
20	316° 37'.6	79° 17'.3	38'.9	168° 29'.0	18'.3	206° 01'.5	01'.3	97° 36'.1	00'.4
21	331° 40'.1	94° 16'.8	39'.7	183° 30'.0	17'.8	221° 03'.7	01'.3	112° 38'.3	00'.5
22	346° 42'.5	109° 16'.4	40'.4	198° 31'.0	17'.3	236° 05'.9	01'.3	127° 40'.5	00'.6
23	1° 45'.0	124° 16'.0	41'.1	213° 32'.0	16'.8	251° 08'.2	01'.2	142° 42'.7	00'.6
8 Tuesday 00	16° 47'.5	139° 15'.6	22° 41'.9 S	228° 33'.0	14° 16'.3 N	266° 10'.4	22° 01'.2 N	157° 44'.8	13° 00'.7 S
01	31° 49'.9	154° 15'.2	42'.6	243° 34'.0	15'.8	281° 12'.6	01'.2	172° 47'.0	00'.8
02	46° 52'.4	169° 14'.7	43'.4	258° 34'.9	15'.3	296° 14'.8	01'.2	187° 49'.2	00'.9
03	61° 54'.8	184° 14'.3	44'.1	273° 35'.9	14'.9	311° 17'.0	01'.1	202° 51'.4	01'.0
04	76° 57'.3	199° 13'.9	44'.8	288° 36'.9	14'.4	326° 19'.2	01'.1	217° 53'.6	01'.1
05	91° 59'.8	214° 13'.5	45'.6	303° 37'.9	13'.9	341° 21'.4	01'.1	232° 55'.8	01'.2
06	107° 02'.2	229° 13'.1	46'.3	318° 38'.9	13'.4	356° 23'.7	01'.1	247° 58'.0	01'.3
07	122° 04'.7	244° 12'.6	47'.0	333° 39'.9	12'.9	11° 25'.9	01'.0	263° 00'.2	01'.4
08	137° 07'.2	259° 12'.2	47'.7	348° 40'.9	12'.4	26° 28'.1	01'.0	278° 02'.4	01'.5
09	152° 09'.6	274° 11'.8	48'.5	3° 41'.9	11'.9	41° 30'.3	01'.0	293° 04'.6	01'.6
10	167° 12'.1	289° 11'.4	49'.2	18° 42'.9	11'.4	56° 32'.5	00'.9	308° 06'.8	01'.6
11	182° 14'.6	304° 11'.0	49'.9	33° 43'.8	10'.9	71° 34'.7	00'.9	323° 09'.0	01'.7
12	197° 17'.0	319° 10'.5	22° 50'.7 S	48° 44'.8	14° 10'.4 N	86° 37'.0	22° 00'.9 N	338° 11'.2	13° 01'.8 S
13	212° 19'.5	334° 10'.1	51'.4	63° 45'.8	09'.9	101° 39'.2	00'.9	353° 13'.3	01'.9
14	227° 22'.0	349° 09'.7	52'.1	78° 46'.8	09'.5	116° 41'.4	00'.8	8° 15'.5	02'.0
15	242° 24'.4	4° 09'.3	52'.8	93° 47'.8	09'.0	131° 43'.6	00'.8	23° 17'.7	02'.1
16	257° 26'.9	19° 08'.9	53'.6	108° 48'.8	08'.5	146° 45'.8	00'.8	38° 19'.9	02'.2
17	272° 29'.3	34° 08'.4	54'.3	123° 49'.8	08'.0	161° 48'.1	00'.7	53° 22'.1	02'.3
18	287° 31'.8	49° 08'.0	55'.0	138° 50'.8	07'.5	176° 50'.3	00'.7	68° 24'.3	02'.4
19	302° 34'.3	64° 07'.6	55'.7	153° 51'.8	07'.0	191° 52'.5	00'.7	83° 26'.5	02'.5
20	317° 36'.7	79° 07'.2	56'.4	168° 52'.8	06'.5	206° 54'.7	00'.7	98° 28'.7	02'.6
21	332° 39'.2	94° 06'.7	57'.2	183° 53'.8	06'.0	221° 56'.9	00'.6	113° 30'.9	02'.6
22	347° 41'.7	109° 06'.3	57'.9	198° 54'.7	05'.5	236° 59'.2	00'.6	128° 33'.1	02'.7
23	2° 44'.1	124° 05'.9	58'.6	213° 55'.7	05'.0	252° 01'.4	00'.6	143° 35'.3	02'.8
9 Wednesday 00	17° 46'.6	139° 05'.5	22° 59'.3 S	228° 56'.7	14° 04'.5 N	267° 03'.6	22° 00'.6 N	158° 37'.5	13° 02'.9 S
01	32° 49'.1	154° 05'.1	23° 00'.0 S	243° 57'.7	04'.0	282° 05'.8	00'.5	173° 39'.6	03'.0
02	47° 51'.5	169° 04'.6	00'.7	258° 58'.7	03'.5	297° 08'.1	00'.5	188° 41'.8	03'.1
03	62° 54'.0	184° 04'.2	01'.4	273° 59'.7	03'.1	312° 10'.3	00'.5	203° 44'.0	03'.2
04	77° 56'.5	199° 03'.8	02'.2	289° 00'.7	02'.6	327° 12'.5	00'.4	218° 46'.2	03'.3
05	92° 58'.9	214° 03'.4	02'.9	304° 01'.7	02'.1	342° 14'.7	00'.4	233° 48'.4	03'.4
06	108° 01'.4	229° 02'.9	03'.6	319° 02'.7	01'.6	357° 16'.9	00'.4	248° 50'.6	03'.5
07	123° 03'.8	244° 02'.5	04'.3	334° 03'.7	01'.1	12° 19'.2	00'.4	263° 52'.8	03'.6
08	138° 06'.3	259° 02'.1	05'.0	349° 04'.7	00'.6	27° 21'.4	00'.3	278° 55'.0	03'.6
09	153° 08'.8	274° 01'.7	05'.7	4° 05'.7	00'.1	42° 23'.6	00'.3	293° 57'.2	03'.7
10	168° 11'.2	289° 01'.2	06'.4	19° 06'.7	13° 59'.6 N	57° 25'.8	00'.3	308° 59'.4	03'.8
11	183° 13'.7	304° 00'.8	07'.1	34° 07'.7	59'.1	72° 28'.1	00'.3	324° 01'.5	03'.9
12	198° 16'.2	319° 00'.4	23° 07'.8 S	49° 08'.7	13° 58'.6 N	87° 30'.3	22° 00'.2 N	339° 03'.7	13° 04'.0 S
13	213° 18'.6	334° 00'.0	08'.5	64° 09'.6	58'.1	102° 32'.5	00'.2	354° 05'.9	04'.1
14	228° 21'.1	348° 59'.5	09'.2	79° 10'.6	57'.6	117° 34'.7	00'.2	9° 08'.1	04'.2
15	243° 23'.6	3° 59'.1	09'.9	94° 11'.6	57'.1	132° 37'.0	00'.1	24° 10'.3	04'.3
16	258° 26'.0	18° 58'.7	10'.6	109° 12'.6	56'.6	147° 39'.2	00'.1	39° 12'.5	04'.4
17	273° 28'.5	33° 58'.3	11'.3	124° 13'.6	56'.1	162° 41'.4	00'.1	54° 14'.7	04'.5
18	288° 31'.0	48° 57'.8	12'.0	139° 14'.6	55'.6	177° 43'.7	00'.1	69° 16'.9	04'.6
19	303° 33'.4	63° 57'.4	12'.7	154° 15'.6	55'.2	192° 45'.9	00'.0	84° 19'.1	04'.6
20	318° 35'.9	78° 57'.0	13'.4	169° 16'.6	54'.7	207° 48'.1	00'.0	99° 21'.3	04'.7
21	333° 38'.3	93° 56'.5	14'.1	184° 17'.6	54'.2	222° 50'.3	00'.0	114° 23'.4	04'.8
22	348° 40'.8	108° 56'.1	14'.8	199° 18'.6	53'.7	237° 52'.6	00'.0	129° 25'.6	04'.9
23	3° 43'.3	123° 55'.7	15'.5	214° 19'.6	53'.2	252° 54'.8	21° 59'.9 N	144° 27'.8	05'.0
	M.P. 22:49	v -0'.4	d 0'.7	v 1'.0	d 0'.5	v 2'.2	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.8	40° 14'.8 S
Achernar	335° 26'.1	57° 09'.9 S
Acrux	173° 09'.7	63° 10'.5 S
Adhara	255° 12'.3	28° 59'.4 S
Aldebaran	290° 48'.9	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.1 N
Alkaid	152° 59'.2	49° 14'.8 N
Alnair	27° 43'.2	46° 53'.6 S
Alnilam	275° 46'.0	1° 11'.6 S
Alphard	217° 56'.1	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 08'.0	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.1	69° 03'.2 S
Avior	234° 18'.1	59° 33'.1 S
Bellatrix	278° 31'.6	6° 21'.7 N
Betelgeuse	271° 01'.0	7° 24'.5 N
Canopus	263° 55'.9	52° 42'.0 S
Capella	280° 33'.9	46° 00'.4 N
Deneb	49° 31'.1	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.4 N
Elnath	278° 12'.2	28° 36'.9 N
Eltanin	90° 46'.2	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.3 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.3 S
Hamal	328° 00'.2	23° 31'.7 N
Kaus Aust.	83° 43'.6	34° 22'.6 S
Kochab	137° 21'.2	74° 06'.1 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.2 S
Miaplacidus	221° 40'.0	69° 46'.3 S
Mirfak	308° 39'.6	49° 54'.4 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 18'.8	56° 41'.4 S
Polaris	317° 16'.1	89° 19'.2 N
Pollux	243° 27'.5	27° 59'.4 N
Procyon	244° 59'.6	5° 11'.3 N
Rasalhague	96° 06'.4	12° 33'.4 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 11'.7	8° 11'.1 S
Rigil Kent	139° 51'.9	60° 53'.5 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.6	56° 36'.9 N
Shaula	96° 21'.8	37° 06'.7 S
Sirius	258° 33'.5	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.5	43° 29'.2 S
Vega	80° 38'.9	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	122° 28'.1	14:43
Mars	211° 45'.5	08:45
Jupiter	249° 22'.9	06:14
Saturn	140° 57'.4	13:27

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
7 Monday 00	183° 01'.4	5° 28'.7 S	159° 17'.4	8'.6	14° 21'.6 S	8'.0	58'.5
01	198° 01'.6	29'.7	173° 45'.0	8'.5	29'.6	7'.9	
02	213° 01'.7	30'.7	188° 12'.5	8'.4	37'.5	7'.9	
03	228° 01'.9	31'.6	202° 39'.9	8'.4	45'.4	7'.7	58'.6
04	243° 02'.1	32'.6	217° 07'.3	8'.3	53'.1	7'.7	
05	258° 02'.3	33'.5	231° 34'.6	8'.3	15° 00'.8 S	7'.6	
06	273° 02'.4	34'.5	246° 01'.9	8'.2	08'.4	7'.5	
07	288° 02'.6	35'.4	260° 29'.1	8'.1	15'.9	7'.4	
08	303° 02'.8	36'.4	274° 56'.2	8'.1	23'.3	7'.3	
09	318° 03'.0	37'.3	289° 23'.3	8'.1	30'.6	7'.2	58'.7
10	333° 03'.2	38'.3	303° 50'.4	7'.9	37'.8	7'.2	
11	348° 03'.3	39'.3	318° 17'.3	8'.0	45'.0	7'.0	
12	3° 03'.5	5° 40'.2 S	332° 44'.3	7'.8	15° 52'.0 S	7'.0	58'.7
13	18° 03'.7	41'.2	347° 11'.1	7'.8	59'.0	6'.8	
14	33° 03'.9	42'.1	1° 37'.9	7'.8	16° 05'.8 S	6'.8	
15	48° 04'.0	43'.1	16° 04'.7	7'.7	12'.6	6'.6	
16	63° 04'.2	44'.0	30° 31'.4	7'.6	19'.2	6'.6	58'.8
17	78° 04'.4	45'.0	44° 58'.0	7'.6	25'.8	6'.5	
18	93° 04'.6	45'.9	59° 24'.6	7'.5	32'.3	6'.3	
19	108° 04'.8	46'.9	73° 51'.1	7'.5	38'.6	6'.3	
20	123° 04'.9	47'.9	88° 17'.6	7'.4	44'.9	6'.2	
21	138° 05'.1	48'.8	102° 44'.0	7'.4	51'.1	6'.0	
22	153° 05'.3	49'.8	117° 10'.4	7'.3	57'.1	6'.0	
23	168° 05'.5	50'.7	131° 36'.7	7'.3	17° 03'.1 S	5'.8	58'.9
8 Tuesday 00	183° 05'.6	5° 51'.7 S	146° 03'.0	7'.2	17° 08'.9 S	5'.8	58'.9
01	198° 05'.8	52'.6	160° 29'.2	7'.1	14'.7	5'.6	
02	213° 06'.0	53'.6	174° 55'.3	7'.2	20'.3	5'.5	
03	228° 06'.2	54'.5	189° 21'.5	7'.0	25'.8	5'.5	
04	243° 06'.3	55'.5	203° 47'.5	7'.0	31'.3	5'.3	
05	258° 06'.5	56'.4	218° 13'.5	7'.0	36'.6	5'.2	
06	273° 06'.7	57'.4	232° 39'.5	6'.9	41'.8	5'.1	
07	288° 06'.9	58'.3	247° 05'.4	6'.9	46'.9	5'.0	59'.0
08	303° 07'.0	59'.3	261° 31'.3	6'.9	51'.9	4'.8	
09	318° 07'.2	6° 00'.2 S	275° 57'.2	6'.8	56'.7	4'.8	
10	333° 07'.4	01'.2	290° 23'.0	6'.7	18° 01'.5 S	4'.6	
11	348° 07'.6	02'.1	304° 48'.7	6'.7	06'.1	4'.6	
12	3° 07'.7	6° 03'.1 S	319° 14'.4	6'.7	18° 10'.7 S	4'.4	59'.0
13	18° 07'.9	04'.1	333° 40'.1	6'.6	15'.1	4'.3	
14	33° 08'.1	05'.0	348° 05'.7	6'.6	19'.4	4'.1	
15	48° 08'.2	06'.0	2° 31'.3	6'.5	23'.5	4'.1	
16	63° 08'.4	06'.9	16° 56'.8	6'.5	27'.6	3'.9	
17	78° 08'.6	07'.9	31° 22'.3	6'.5	31'.5	3'.9	59'.1
18	93° 08'.8	08'.8	45° 47'.8	6'.4	35'.4	3'.7	
19	108° 08'.9	09'.8	60° 13'.2	6'.4	39'.1	3'.5	
20	123° 09'.1	10'.7	74° 38'.6	6'.4	42'.6	3'.5	
21	138° 09'.3	11'.7	89° 04'.0	6'.3	46'.1	3'.4	
22	153° 09'.4	12'.6	103° 29'.3	6'.3	49'.5	3'.2	
23	168° 09'.6	13'.6	117° 54'.6	6'.3	52'.7	3'.1	
9 Wednesday 00	183° 09'.8	6° 14'.5 S	132° 19'.9	6'.3	18° 55'.8 S	2'.9	59'.1
01	198° 10'.0	15'.5	146° 45'.2	6'.2	58'.7	2'.9	
02	213° 10'.1	16'.4	161° 10'.4	6'.1	19° 01'.6 S	2'.7	
03	228° 10'.3	17'.4	175° 35'.5	6'.2	04'.3	2'.6	
04	243° 10'.5	18'.3	190° 00'.7	6'.1	06'.9	2'.5	
05	258° 10'.6	19'.3	204° 25'.8	6'.1	09'.4	2'.3	59'.2
06	273° 10'.8	20'.2	218° 50'.9	6'.1	11'.7	2'.3	
07	288° 11'.0	21'.2	233° 16'.0	6'.1	14'.0	2'.1	
08	303° 11'.2	22'.1	247° 41'.1	6'.0	16'.1	1'.9	
09	318° 11'.3	23'.1	262° 06'.1	6'.1	18'.0	1'.9	
10	333° 11'.5	24'.0	276° 31'.2	6'.0	19'.9	1'.7	
11	348° 11'.7	25'.0	290° 56'.2	5'.9	21'.6	1'.6	
12	3° 11'.8	6° 25'.9 S	305° 21'.1	6'.0	19° 23'.2 S	1'.5	59'.2
13	18° 12'.0	26'.9	319° 46'.1	6'.0	24'.7	1'.3	
14	33° 12'.2	27'.8	334° 11'.1	5'.9	26'.0	1'.2	
15	48° 12'.3	28'.8	348° 36'.0	5'.9	27'.2	1'.1	
16	63° 12'.5	29'.7	3° 00'.9	5'.9	28'.3	0'.9	
17	78° 12'.7	30'.7	17° 25'.8	6'.0	29'.2	0'.8	
18	93° 12'.8	31'.6	31° 50'.8	5'.8	30'.0	0'.7	
19	108° 13'.0	32'.5	46° 15'.6	5'.9	30'.7	0'.6	
20	123° 13'.2	33'.5	60° 40'.5	5'.9	31'.3	0'.4	
21	138° 13'.3	34'.4	75° 05'.4	5'.9	31'.7	0'.3	
22	153° 13'.5	35'.4	89° 30'.3	5'.9	32'.0	0'.2	
23	168° 13'.7	36'.3	103° 55'.2	5'.8	32'.2	0'.0	
	SD 16'.0	d 1'.0	SD 16'.0		16'.1	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 7	Moonrise 8	Moonrise 9
N 72°	04:24	05:43	06:51	11:57	-	-
N 70°	04:32	05:43	06:44	11:14	13:10	14:58
68°	04:38	05:42	06:38	10:45	12:25	13:50
66°	04:42	05:42	06:33	10:24	11:55	13:13
64°	04:46	05:42	06:29	10:07	11:33	12:48
62°	04:50	05:41	06:26	09:53	11:15	12:27
60°	04:53	05:41	06:22	09:41	11:00	12:11
N 58°	04:55	05:40	06:20	09:31	10:48	11:57
56°	04:57	05:40	06:17	09:22	10:37	11:45
54°	04:59	05:39	06:15	09:14	10:27	11:35
52°	05:00	05:39	06:13	09:07	10:19	11:25
50°	05:01	05:39	06:11	09:01	10:11	11:17
45°	05:03	05:37	06:07	08:47	09:55	10:59
N 40°	05:05	05:36	06:03	08:36	09:42	10:45
35°	05:06	05:35	06:00	08:27	09:31	10:33
30°	05:06	05:34	05:57	08:18	09:21	10:22
20°	05:05	05:31	05:53	08:04	09:04	10:04
N 10°	05:03	05:27	05:48	07:52	08:50	09:48
0°	04:59	05:23	05:44	07:40	08:36	09:34
S 10°	04:54	05:19	05:40	07:29	08:22	09:19
20°	04:47	05:13	05:35	07:16	08:08	09:03
30°	04:37	05:06	05:30	07:03	07:51	08:45
35°	04:31	05:01	05:27	06:55	07:42	08:35
40°	04:23	04:56	05:23	06:45	07:31	08:23
45°	04:13	04:49	05:19	06:35	07:18	08:09
S 50°	04:01	04:41	05:14	06:22	07:03	07:52
52°	03:55	04:37	05:11	06:16	06:56	07:44
54°	03:48	04:32	05:09	06:10	06:48	07:35
56°	03:40	04:28	05:06	06:02	06:39	07:25
58°	03:31	04:22	05:03	05:54	06:29	07:13
S 60°	03:21	04:16	04:59	05:45	06:17	07:00
S 62°	03:08	04:08	04:55	05:35	06:04	06:44

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 7	Moonset 8	Moonset 9
N 72°	16:42	17:49	19:08	15:37	-	-
N 70°	16:49	17:50	19:01	16:21	16:21	16:35
68°	16:55	17:51	18:55	16:50	17:07	17:44
66°	17:00	17:51	18:50	17:12	17:38	18:20
64°	17:04	17:52	18:47	17:30	18:00	18:46
62°	17:08	17:52	18:44	17:45	18:19	19:06
60°	17:11	17:53	18:41	17:57	18:34	19:23
N 58°	17:14	17:53	18:39	18:08	18:47	19:37
56°	17:17	17:54	18:37	18:17	18:58	19:49
54°	17:19	17:54	18:35	18:25	19:07	19:59
52°	17:21	17:55	18:34	18:33	19:16	20:09
50°	17:23	17:55	18:33	18:40	19:24	20:17
45°	17:27	17:57	18:31	18:54	19:41	20:35
N 40°	17:31	17:58	18:29	19:06	19:54	20:49
35°	17:34	18:00	18:29	19:16	20:06	21:01
30°	17:37	18:01	18:29	19:25	20:16	21:12
20°	17:42	18:04	18:30	19:40	20:34	21:30
N 10°	17:46	18:08	18:32	19:54	20:49	21:46
0°	17:51	18:12	18:36	20:06	21:03	22:01
S 10°	17:55	18:16	18:41	20:19	21:18	22:16
20°	18:00	18:22	18:48	20:33	21:33	22:32
30°	18:06	18:30	18:58	20:48	21:50	22:50
35°	18:09	18:34	19:05	20:57	22:01	23:01
40°	18:13	18:40	19:13	21:07	22:12	23:13
45°	18:17	18:47	19:23	21:20	22:26	23:28
S 50°	18:22	18:55	19:35	21:34	22:43	23:45
52°	18:25	18:59	19:42	21:41	22:51	23:53
54°	18:27	19:04	19:49	21:49	22:59	24:02
56°	18:30	19:09	19:57	21:57	23:09	24:13
58°	18:34	19:15	20:06	22:07	23:21	24:25
S 60°	18:37	19:21	20:17	22:18	23:34	24:38
S 62°	18:42	19:29	20:29	22:31	23:49	24:54

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
7	12 05	12 14	11:48	13:53	01:26	2d 7%
8	12 22	12 31	11:47	14:50	02:21	3d 14%
9	12 39	12 47	11:47	15:47	03:18	4d 23%

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2013 October 10, 11, 12 (Thur, Fri, Saint)

GMT	ARIES	VENUS -4.2		MARS +1.6		JUPITER -2.2		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
10 Thursday 00	18° 45'.7	138° 55'.3	23° 16'.2 S	229° 20'.6	13° 52'.7 N	267° 57'.0	21° 59'.9 N	159° 30'.0	13° 05'.1 S
01	33° 48'.2	153° 54'.8	16'.9	244° 21'.6	52'.2	282° 59'.3	59'.9	174° 32'.2	05'.2
02	48° 50'.7	168° 54'.4	17'.6	259° 22'.6	51'.7	298° 01'.5	59'.8	189° 34'.4	05'.3
03	63° 53'.1	183° 54'.0	18'.3	274° 23'.6	51'.2	313° 03'.7	59'.8	204° 36'.6	05'.4
04	78° 55'.6	198° 53'.6	19'.0	289° 24'.6	50'.7	328° 05'.9	59'.8	219° 38'.8	05'.5
05	93° 58'.1	213° 53'.1	19'.6	304° 25'.6	50'.2	343° 08'.2	59'.8	234° 41'.0	05'.6
06	109° 00'.5	228° 52'.7	20'.3	319° 26'.6	49'.7	358° 10'.4	59'.7	249° 43'.2	05'.6
07	124° 03'.0	243° 52'.3	21'.0	334° 27'.6	49'.2	13° 12'.6	59'.7	264° 45'.3	05'.7
08	139° 05'.4	258° 51'.8	21'.7	349° 28'.6	48'.7	28° 14'.9	59'.7	279° 47'.5	05'.8
09	154° 07'.9	273° 51'.4	22'.4	4° 29'.6	48'.2	43° 17'.1	59'.7	294° 49'.7	05'.9
10	169° 10'.4	288° 51'.0	23'.1	19° 30'.6	47'.7	58° 19'.3	59'.6	309° 51'.9	06'.0
11	184° 12'.8	303° 50'.6	23'.8	34° 31'.6	47'.2	73° 21'.6	59'.6	324° 54'.1	06'.1
12	199° 15'.3	318° 50'.1	23° 24'.4 S	49° 32'.6	13° 46'.7 N	88° 23'.8	21° 59'.6 N	339° 56'.3	13° 06'.2 S
13	214° 17'.8	333° 49'.7	25'.1	64° 33'.6	46'.2	103° 26'.0	59'.6	354° 58'.5	06'.3
14	229° 20'.2	348° 49'.3	25'.8	79° 34'.6	45'.7	118° 28'.3	59'.5	10° 00'.7	06'.4
15	244° 22'.7	3° 48'.8	26'.5	94° 35'.6	45'.2	133° 30'.5	59'.5	25° 02'.9	06'.5
16	259° 25'.2	18° 48'.4	27'.2	109° 36'.6	44'.7	148° 32'.7	59'.5	40° 05'.0	06'.6
17	274° 27'.6	33° 48'.0	27'.8	124° 37'.6	44'.3	163° 35'.0	59'.5	55° 07'.2	06'.7
18	289° 30'.1	48° 47'.6	28'.5	139° 38'.6	43'.8	178° 37'.2	59'.4	70° 09'.4	06'.7
19	304° 32'.6	63° 47'.1	29'.2	154° 39'.6	43'.3	193° 39'.4	59'.4	85° 11'.6	06'.8
20	319° 35'.0	78° 46'.7	29'.9	169° 40'.6	42'.8	208° 41'.7	59'.4	100° 13'.8	06'.9
21	334° 37'.5	93° 46'.3	30'.5	184° 41'.6	42'.3	223° 43'.9	59'.4	115° 16'.0	07'.0
22	349° 39'.9	108° 45'.8	31'.2	199° 42'.6	41'.8	238° 46'.1	59'.3	130° 18'.2	07'.1
23	4° 42'.4	123° 45'.4	31'.9	214° 43'.6	41'.3	253° 48'.4	59'.3	145° 20'.4	07'.2
11 Friday 00	19° 44'.9	138° 45'.0	23° 32'.5 S	229° 44'.6	13° 40'.8 N	268° 50'.6	21° 59'.3 N	160° 22'.6	13° 07'.3 S
01	34° 47'.3	153° 44'.5	33'.2	244° 45'.6	40'.3	283° 52'.9	59'.2	175° 24'.7	07'.4
02	49° 49'.8	168° 44'.1	33'.9	259° 46'.6	39'.8	298° 55'.1	59'.2	190° 26'.9	07'.5
03	64° 52'.3	183° 43'.7	34'.5	274° 47'.6	39'.3	313° 57'.3	59'.2	205° 29'.1	07'.6
04	79° 54'.7	198° 43'.2	35'.2	289° 48'.6	38'.8	328° 59'.6	59'.2	220° 31'.3	07'.7
05	94° 57'.2	213° 42'.8	35'.9	304° 49'.6	38'.3	344° 01'.8	59'.1	235° 33'.5	07'.7
06	109° 59'.7	228° 42'.4	36'.5	319° 50'.6	37'.8	359° 04'.0	59'.1	250° 35'.7	07'.8
07	125° 02'.1	243° 41'.9	37'.2	334° 51'.6	37'.3	14° 06'.3	59'.1	265° 37'.9	07'.9
08	140° 04'.6	258° 41'.5	37'.9	349° 52'.6	36'.8	29° 08'.5	59'.1	280° 40'.1	08'.0
09	155° 07'.1	273° 41'.1	38'.5	4° 53'.6	36'.3	44° 10'.8	59'.0	295° 42'.2	08'.1
10	170° 09'.5	288° 40'.7	39'.2	19° 54'.6	35'.8	59° 13'.0	59'.0	310° 44'.4	08'.2
11	185° 12'.0	303° 40'.2	39'.8	34° 55'.6	35'.3	74° 15'.2	59'.0	325° 46'.6	08'.3
12	200° 14'.4	318° 39'.8	23° 40'.5 S	49° 56'.6	13° 34'.8 N	89° 17'.5	21° 59'.0 N	340° 48'.8	13° 08'.4 S
13	215° 16'.9	333° 39'.4	41'.2	64° 57'.6	34'.3	104° 19'.7	58'.9	355° 51'.0	08'.5
14	230° 19'.4	348° 38'.9	41'.8	79° 58'.6	33'.8	119° 22'.0	58'.9	10° 53'.2	08'.6
15	245° 21'.8	3° 38'.5	42'.5	94° 59'.6	33'.3	134° 24'.2	58'.9	25° 55'.4	08'.7
16	260° 24'.3	18° 38'.1	43'.1	110° 00'.7	32'.8	149° 26'.5	58'.9	40° 57'.6	08'.8
17	275° 26'.8	33° 37'.6	43'.8	125° 01'.7	32'.3	164° 28'.7	58'.8	55° 59'.7	08'.8
18	290° 29'.2	48° 37'.2	44'.4	140° 02'.7	31'.8	179° 30'.9	58'.8	71° 01'.9	08'.9
19	305° 31'.7	63° 36'.8	45'.1	155° 03'.7	31'.3	194° 33'.2	58'.8	86° 04'.1	09'.0
20	320° 34'.2	78° 36'.3	45'.7	170° 04'.7	30'.8	209° 35'.4	58'.8	101° 06'.3	09'.1
21	335° 36'.6	93° 35'.9	46'.4	185° 05'.7	30'.3	224° 37'.7	58'.7	116° 08'.5	09'.2
22	350° 39'.1	108° 35'.5	47'.0	200° 06'.7	29'.8	239° 39'.9	58'.7	131° 10'.7	09'.3
23	5° 41'.6	123° 35'.0	47'.7	215° 07'.7	29'.3	254° 42'.2	58'.7	146° 12'.9	09'.4
12 Saturday 00	20° 44'.0	138° 34'.6	23° 48'.3 S	230° 08'.7	13° 28'.8 N	269° 44'.4	21° 58'.7 N	161° 15'.1	13° 09'.5 S
01	35° 46'.5	153° 34'.2	49'.0	245° 09'.7	28'.3	284° 46'.6	58'.6	176° 17'.2	09'.6
02	50° 48'.9	168° 33'.7	49'.6	260° 10'.7	27'.8	299° 48'.9	58'.6	191° 19'.4	09'.7
03	65° 51'.4	183° 33'.3	50'.3	275° 11'.7	27'.3	314° 51'.1	58'.6	206° 21'.6	09'.8
04	80° 53'.9	198° 32'.9	50'.9	290° 12'.7	26'.8	329° 53'.4	58'.6	221° 23'.8	09'.8
05	95° 56'.3	213° 32'.4	51'.6	305° 13'.7	26'.3	344° 55'.6	58'.5	236° 26'.0	09'.9
06	110° 58'.8	228° 32'.0	52'.2	320° 14'.7	25'.8	359° 57'.9	58'.5	251° 28'.2	10'.0
07	126° 01'.3	243° 31'.6	52'.8	335° 15'.8	25'.3	15° 00'.1	58'.5	266° 30'.4	10'.1
08	141° 03'.7	258° 31'.1	53'.5	350° 16'.8	24'.8	30° 02'.4	58'.5	281° 32'.6	10'.2
09	156° 06'.2	273° 30'.7	54'.1	5° 17'.8	24'.3	45° 04'.6	58'.4	296° 34'.7	10'.3
10	171° 08'.7	288° 30'.3	54'.7	20° 18'.8	23'.8	60° 06'.9	58'.4	311° 36'.9	10'.4
11	186° 11'.1	303° 29'.8	55'.4	35° 19'.8	23'.3	75° 09'.1	58'.4	326° 39'.1	10'.5
12	201° 13'.6	318° 29'.4	23° 56'.0 S	50° 20'.8	13° 22'.8 N	90° 11'.4	21° 58'.4 N	341° 41'.3	13° 10'.6 S
13	216° 16'.0	333° 28'.9	56'.7	65° 21'.8	22'.3	105° 13'.6	58'.3	356° 43'.5	10'.7
14	231° 18'.5	348° 28'.5	57'.3	80° 22'.8	21'.8	120° 15'.8	58'.3	11° 45'.7	10'.8
15	246° 21'.0	3° 28'.1	57'.9	95° 23'.8	21'.3	135° 18'.1	58'.3	26° 47'.9	10'.9
16	261° 23'.4	18° 27'.6	58'.6	110° 24'.8	20'.8	150° 20'.3	58'.3	41° 50'.0	10'.9
17	276° 25'.9	33° 27'.2	59'.2	125° 25'.8	20'.3	165° 22'.6	58'.2	56° 52'.2	11'.0
18	291° 28'.4	48° 26'.8	59'.8	140° 26'.9	19'.8	180° 24'.8	58'.2	71° 54'.4	11'.1
19	306° 30'.8	63° 26'.3	24° 00'.4 S	155° 27'.9	19'.3	195° 27'.1	58'.2	86° 56'.6	11'.2
20	321° 33'.3	78° 25'.9	01'.1	170° 28'.9	18'.8	210° 29'.3	58'.2	101° 58'.8	11'.3
21	336° 35'.8	93° 25'.5	01'.7	185° 29'.9	18'.3	225° 31'.6	58'.2	117° 01'.0	11'.4
22	351° 38'.2	108° 25'.0	02'.3	200° 30'.9	17'.8	240° 33'.8	58'.1	132° 03'.2	11'.5
23	6° 40'.7	123° 24'.6	02'.9	215° 31'.9	17'.3	255° 36'.1	58'.1	147° 05'.3	11'.6
	M.P. 22:37	v -0'.4	d 0'.7	v 1'.0	d 0'.5	v 2'.2	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.8	40° 14'.9 S
Achernar	335° 26'.1	57° 09'.9 S
Acrux	173° 09'.7	63° 10'.4 S
Adhara	255° 12'.3	28° 59'.4 S
Aldebaran	290° 48'.9	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.1 N
Alkaid	152° 59'.2	49° 14'.8 N
Alnair	27° 43'.2	46° 53'.6 S
Alnilam	275° 46'.0	1° 11'.6 S
Alphard	217° 56'.0	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 08'.0	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.1	69° 03'.2 S
Avior	234° 18'.1	59° 33'.0 S
Bellatrix	278° 31'.6	6° 21'.7 N
Betelgeuse	271° 00'.9	7° 24'.5 N
Canopus	263° 55'.9	52° 42'.0 S
Capella	280° 33'.9	46° 00'.4 N
Deneb	49° 31'.1	45° 20'.2 N
Denebola	182° 33'.8	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.1	61° 40'.4 N
Elnath	278° 12'.2	28° 36'.9 N
Eltanin	90° 46'.2	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.8 S
Gacrux	172° 01'.2	57° 11'.3 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.3 S
Hamal	328° 00'.2	23° 31'.7 N
Kaus Aust.	83° 43'.6	34° 22'.6 S
Kochab	137° 21'.2	74° 06'.1 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.2 S
Miaplacidus	221° 40'.0	69° 46'.3 S
Mirfak	308° 39'.6	49° 54'.5 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 18'.8	56° 41'.4 S
Polaris	317° 15'.2	89° 19'.2 N
Pollux	243° 27'.5	27° 59'.3 N
Procyon	244° 59'.5	5° 11'.3 N
Rasalhague	96° 06'.4	12° 33'.3 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 11'.7	8° 11'.1 S
Rigil Kent	139° 51'.9	60° 53'.5 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.6	56° 36'.9 N
Shaula	96° 21'.8	37° 06'.7 S
Sirius	258° 33'.5	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.5	43° 29'.2 S
Vega	80° 38'.9	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	119° 00'.1	14:45
Mars	209° 59'.7	08:40
Jupiter	249° 05'.7	06:04
Saturn	140° 37'.7	13:17

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 13'.8	6° 37'.3 S	118° 20'.0	5'.9	19° 32'.2 S	0'.1	59'.3
198° 14'.0	38'.2	132° 44'.9	5'.8	32'.1	0'.2	
213° 14'.2	39'.2	147° 09'.7	5'.9	31'.9	0'.3	
228° 14'.3	40'.1	161° 34'.6	5'.9	31'.6	0'.5	
243° 14'.5	41'.1	175° 59'.5	5'.8	31'.1	0'.6	
258° 14'.7	42'.0	190° 24'.3	5'.9	30'.5	0'.7	
273° 14'.8	43'.0	204° 49'.2	5'.9	29'.8	0'.9	
288° 15'.0	43'.9	219° 14'.1	5'.9	28'.9	1'.0	
303° 15'.2	44'.9	233° 39'.0	5'.9	27'.9	1'.1	
318° 15'.3	45'.8	248° 03'.9	5'.9	26'.8	1'.3	
333° 15'.5	46'.7	262° 28'.8	5'.9	25'.5	1'.4	
348° 15'.7	47'.7	276° 53'.7	5'.9	24'.1	1'.5	
3° 15'.8	6° 48'.6 S	291° 18'.6	5'.9	19° 22'.6 S	1'.6	59'.3
18° 16'.0	49'.6	305° 43'.5	5'.9	21'.0	1'.8	
33° 16'.1	50'.5	320° 08'.4	6'.0	19'.2	1'.9	
48° 16'.3	51'.5	334° 33'.4	6'.0	17'.3	2'.0	
63° 16'.5	52'.4	348° 58'.4	6'.0	15'.3	2'.1	
78° 16'.6	53'.4	3° 23'.4	6'.0	13'.2	2'.3	
93° 16'.8	54'.3	17° 48'.4	6'.0	10'.9	2'.4	
108° 17'.0	55'.2	32° 13'.4	6'.0	08'.5	2'.5	
123° 17'.1	56'.2	46° 38'.4	6'.1	06'.0	2'.7	
138° 17'.3	57'.1	61° 03'.5	6'.1	03'.3	2'.8	
153° 17'.5	58'.1	75° 28'.6	6'.1	00'.5	2'.9	
168° 17'.6	59'.0	89° 53'.7	6'.1	18° 57'.6 S	3'.0	
183° 17'.8	7° 00'.0 S	104° 18'.8	6'.1	18° 54'.6 S	3'.2	59'.3
198° 17'.9	7° 00'.9 S	118° 43'.9	6'.2	51'.4	3'.2	
213° 18'.1	01'.8	133° 09'.1	6'.2	48'.2	3'.4	
228° 18'.3	02'.8	147° 34'.3	6'.3	44'.8	3'.6	
243° 18'.4	03'.7	161° 59'.6	6'.2	41'.2	3'.6	
258° 18'.6	04'.7	176° 24'.8	6'.3	37'.6	3'.8	
273° 18'.7	05'.6	190° 50'.1	6'.3	33'.8	3'.9	
288° 18'.9	06'.6	205° 15'.4	6'.4	29'.9	4'.0	
303° 19'.1	07'.5	219° 40'.8	6'.4	25'.9	4'.1	
318° 19'.2	08'.4	234° 06'.2	6'.4	21'.8	4'.3	
333° 19'.4	09'.4	248° 31'.6	6'.4	17'.5	4'.3	
348° 19'.5	10'.3	262° 57'.0	6'.5	13'.2	4'.5	
3° 19'.7	7° 11'.3 S	277° 22'.5	6'.5	18° 08'.7 S	4'.6	59'.3
18° 19'.9	12'.2	291° 48'.0	6'.6	04'.1	4'.7	
33° 20'.0	13'.1	306° 13'.6	6'.5	17° 59'.4 S	4'.9	
48° 20'.2	14'.1	320° 39'.1	6'.7	54'.5	4'.9	
63° 20'.3	15'.0	335° 04'.8	6'.6	49'.6	5'.1	
78° 20'.5	16'.0	349° 30'.4	6'.7	44'.5	5'.2	
93° 20'.7	16'.9	3° 56'.1	6'.8	39'.3	5'.2	
108° 20'.8	17'.8	18° 21'.9	6'.7	34'.1	5'.5	
123° 21'.0	18'.8	32° 47'.6	6'.9	28'.6	5'.5	
138° 21'.1	19'.7	47° 13'.5	6'.8	23'.1	5'.6	
153° 21'.3	20'.7	61° 39'.3	6'.9	17'.5	5'.7	
168° 21'.4	21'.6	76° 05'.2	7'.0	11'.8	5'.9	
183° 21'.6	7° 22'.5 S	90° 31'.2	7'.0	17° 05'.9 S	5'.9	59'.3
198° 21'.8	23'.5	104° 57'.2	7'.0	17° 00'.0 S	6'.1	59'.2
213° 21'.9	24'.4	119° 23'.2	7'.1	53'.9	6'.2	
228° 22'.1	25'.4	133° 49'.3	7'.1	47'.7	6'.2	
243° 22'.2	26'.3	148° 15'.4	7'.2	41'.5	6'.4	
258° 22'.4	27'.2	162° 41'.6	7'.2	35'.1	6'.5	
273° 22'.5	28'.2	177° 07'.8	7'.2	28'.6	6'.6	
288° 22'.7	29'.1	191° 34'.0	7'.3	22'.0	6'.7	
303° 22'.8	30'.0	206° 00'.3	7'.4	15'.3	6'.7	
318° 23'.0	31'.0	220° 26'.7	7'.4	08'.6	6'.9	
333° 23'.2	31'.9	234° 53'.1	7'.4	01'.7	7'.0	
348° 23'.3	32'.9	249° 19'.5	7'.5	15° 54'.7 S	7'.1	
3° 23'.5	7° 33'.8 S	263° 46'.0	7'.5	15° 47'.6 S	7'.2	59'.2
18° 23'.6	34'.7	278° 12'.5	7'.6	40'.4	7'.3	
33° 23'.8	35'.7	292° 39'.1	7'.6	33'.1	7'.3	
48° 23'.9	36'.6	307° 05'.7	7'.7	25'.8	7'.5	
63° 24'.1	37'.5	321° 32'.4	7'.7	18'.3	7'.6	
78° 24'.2	38'.5	335° 59'.1	7'.8	10'.7	7'.6	
93° 24'.4	39'.4	350° 25'.9	7'.8	03'.1	7'.8	
108° 24'.5	40'.3	4° 52'.7	7'.9	14° 55'.3 S	7'.8	
123° 24'.7	41'.3	19° 19'.6	7'.9	47'.5	7'.9	
138° 24'.8	42'.2	33° 46'.5	8'.0	39'.6	8'.0	59'.1
153° 25'.0	43'.1	48° 13'.5	8'.0	31'.6	8'.1	
168° 25'.1	44'.1	62° 40'.5	8'.1	23'.5	8'.2	
SD 16'.0	d 0'.9	SD 16'.2		16'.2	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 10	Moonrise 11	Moonrise 12
N 72°	04:38	05:56	07:05	-	17:14	16:27
N 70°	04:44	05:55	06:57	15:46	15:52	15:52
68°	04:48	05:53	06:49	14:45	15:13	15:26
66°	04:52	05:51	06:43	14:10	14:46	15:07
64°	04:55	05:50	06:38	13:45	14:25	14:51
62°	04:58	05:49	06:34	13:25	14:08	14:38
60°	05:00	05:48	06:30	13:09	13:53	14:27
N 58°	05:01	05:47	06:26	12:55	13:41	14:17
56°	05:03	05:46	06:23	12:43	13:31	14:08
54°	05:04	05:45	06:20	12:33	13:21	14:01
52°	05:05	05:44	06:18	12:24	13:13	13:54
50°	05:06	05:43	06:16	12:16	13:06	13:48
45°	05:07	05:41	06:11	11:58	12:50	13:34
N 40°	05:08	05:39	06:06	11:44	12:36	13:23
35°	05:08	05:37	06:03	11:32	12:25	13:14
30°	05:08	05:35	05:59	11:21	12:15	13:05
20°	05:06	05:31	05:54	11:03	11:59	12:51
N 10°	05:03	05:27	05:48	10:47	11:44	12:38
0°	04:58	05:23	05:43	10:32	11:30	12:27
S 10°	04:52	05:17	05:38	10:17	11:16	12:15
20°	04:45	05:11	05:33	10:01	11:01	12:02
30°	04:34	05:02	05:26	09:43	10:44	11:48
35°	04:27	04:57	05:23	09:33	10:35	11:39
40°	04:18	04:51	05:18	09:21	10:23	11:30
45°	04:07	04:43	05:13	09:06	10:10	11:18
S 50°	03:54	04:34	05:07	08:49	09:54	11:05
52°	03:47	04:30	05:05	08:41	09:46	10:58
54°	03:40	04:25	05:02	08:32	09:38	10:51
56°	03:31	04:19	04:58	08:21	09:28	10:43
58°	03:21	04:13	04:54	08:09	09:18	10:34
S 60°	03:10	04:06	04:50	07:56	09:05	10:24
S 62°	02:56	03:58	04:45	07:40	08:50	10:12

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 10	Moonset 11	Moonset 12
N 72°	16:26	17:35	18:53	-	18:23	21:08
N 70°	16:35	17:37	18:47	17:50	19:44	21:42
68°	16:42	17:39	18:43	18:50	20:23	22:06
66°	16:49	17:40	18:39	19:25	20:50	22:24
64°	16:54	17:42	18:36	19:50	21:10	22:39
62°	16:58	17:43	18:34	20:10	21:27	22:52
60°	17:02	17:44	18:32	20:26	21:40	23:03
N 58°	17:06	17:45	18:31	20:39	21:52	23:12
56°	17:09	17:46	18:29	20:51	22:02	23:20
54°	17:12	17:47	18:28	21:01	22:11	23:27
52°	17:15	17:48	18:27	21:10	22:19	23:33
50°	17:17	17:49	18:27	21:18	22:26	23:39
45°	17:22	17:52	18:25	21:35	22:42	23:51
N 40°	17:26	17:54	18:25	21:50	22:54	24:01
35°	17:30	17:56	18:25	22:02	23:05	24:10
30°	17:34	17:58	18:25	22:12	23:14	24:18
20°	17:40	18:02	18:27	22:30	23:30	24:31
N 10°	17:45	18:06	18:31	22:45	23:44	24:42
0°	17:50	18:11	18:35	23:00	23:57	24:53
S 10°	17:55	18:16	18:41	23:14	-	00:10
20°	18:01	18:23	18:49	23:30	-	00:24
30°	18:07	18:32	19:00	23:47	-	00:39
35°	18:11	18:37	19:07	23:57	-	00:48
40°	18:16	18:43	19:16	-	00:09	00:59
45°	18:21	18:51	19:27	-	00:23	01:11
S 50°	18:27	19:00	19:41	-	00:39	01:25
52°	18:30	19:05	19:48	-	00:47	01:32
54°	18:33	19:10	19:56	00:02	00:56	01:40
56°	18:36	19:16	20:04	00:13	01:06	01:48
58°	18:40	19:22	20:14	00:25	01:17	01:57
S 60°	18:45	19:29	20:26	00:38	01:29	02:08
S 62°	18:50	19:38	20:41	00:54	01:44	02:21

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
10	12 55	13 03	11:47	16:46	04:17	5d 34%
11	13 11	13 18	11:47	17:44	05:15	6d 45%
12	13 26	13 34	11:46	18:40	06:12	7d 56%

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2013 October 13, 14, 15 (Sun, Mon, Tue)

GMT	ARIES	VENUS -4.3		MARS +1.6		JUPITER -2.3		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
13 Sunday 00	21° 43'.2	138° 24'.2	24° 03'.6 S	230° 32'.9	13° 16'.8 N	270° 38'.4	21° 58'.1 N	162° 07'.5	13° 11'.7 S
01	36° 45'.6	153° 23'.7	04'.2	245° 33'.9	16'.3	285° 40'.6	58'.1	177° 09'.7	11'.8
02	51° 48'.1	168° 23'.3	04'.8	260° 35'.0	15'.8	300° 42'.9	58'.0	192° 11'.9	11'.9
03	66° 50'.5	183° 22'.8	05'.4	275° 36'.0	15'.3	315° 45'.1	58'.0	207° 14'.1	12'.0
04	81° 53'.0	198° 22'.4	06'.1	290° 37'.0	14'.8	330° 47'.4	58'.0	222° 16'.3	12'.0
05	96° 55'.5	213° 22'.0	06'.7	305° 38'.0	14'.3	345° 49'.6	58'.0	237° 18'.5	12'.1
06	111° 57'.9	228° 21'.5	07'.3	320° 39'.0	13'.8	0° 51'.9	57'.9	252° 20'.6	12'.2
07	127° 00'.4	243° 21'.1	07'.9	335° 40'.0	13'.3	15° 54'.1	57'.9	267° 22'.8	12'.3
08	142° 02'.9	258° 20'.7	08'.5	350° 41'.0	12'.8	30° 56'.4	57'.9	282° 25'.0	12'.4
09	157° 05'.3	273° 20'.2	09'.1	5° 42'.0	12'.3	45° 58'.6	57'.9	297° 27'.2	12'.5
10	172° 07'.8	288° 19'.8	09'.7	20° 43'.1	11'.8	61° 00'.9	57'.8	312° 29'.4	12'.6
11	187° 10'.3	303° 19'.4	10'.4	35° 44'.1	11'.3	76° 03'.1	57'.8	327° 31'.6	12'.7
12	202° 12'.7	318° 18'.9	24° 11'.0 S	50° 45'.1	13° 10'.8 N	91° 05'.4	21° 57'.8 N	342° 33'.8	13° 12'.8 S
13	217° 15'.2	333° 18'.5	11'.6	65° 46'.1	10'.3	106° 07'.7	57'.8	357° 35'.9	12'.9
14	232° 17'.7	348° 18'.0	12'.2	80° 47'.1	09'.8	121° 09'.9	57'.8	12° 38'.1	13'.0
15	247° 20'.1	3° 17'.6	12'.8	95° 48'.1	09'.3	136° 12'.2	57'.7	27° 40'.3	13'.0
16	262° 22'.6	18° 17'.2	13'.4	110° 49'.1	08'.8	151° 14'.4	57'.7	42° 42'.5	13'.1
17	277° 25'.0	33° 16'.7	14'.0	125° 50'.2	08'.3	166° 16'.7	57'.7	57° 44'.7	13'.2
18	292° 27'.5	48° 16'.3	14'.6	140° 51'.2	07'.8	181° 18'.9	57'.7	72° 46'.9	13'.3
19	307° 30'.0	63° 15'.9	15'.2	155° 52'.2	07'.3	196° 21'.2	57'.6	87° 49'.1	13'.4
20	322° 32'.4	78° 15'.4	15'.8	170° 53'.2	06'.8	211° 23'.5	57'.6	102° 51'.2	13'.5
21	337° 34'.9	93° 15'.0	16'.4	185° 54'.2	06'.3	226° 25'.7	57'.6	117° 53'.4	13'.6
22	352° 37'.4	108° 14'.5	17'.0	200° 55'.2	05'.8	241° 28'.0	57'.6	132° 55'.6	13'.7
23	7° 39'.8	123° 14'.1	17'.6	215° 56'.3	05'.3	256° 30'.2	57'.5	147° 57'.8	13'.8
14 Monday 00	22° 42'.3	138° 13'.7	24° 18'.2 S	230° 57'.3	13° 04'.8 N	271° 32'.5	21° 57'.5 N	163° 00'.0	13° 13'.9 S
01	37° 44'.8	153° 13'.2	18'.8	245° 58'.3	04'.3	286° 34'.8	57'.5	178° 02'.2	14'.0
02	52° 47'.2	168° 12'.8	19'.4	260° 59'.3	03'.7	301° 37'.0	57'.5	193° 04'.3	14'.1
03	67° 49'.7	183° 12'.4	20'.0	276° 00'.3	03'.2	316° 39'.3	57'.5	208° 06'.5	14'.1
04	82° 52'.1	198° 11'.9	20'.6	291° 01'.3	02'.7	331° 41'.5	57'.4	223° 08'.7	14'.2
05	97° 54'.6	213° 11'.5	21'.2	306° 02'.4	02'.2	346° 43'.8	57'.4	238° 10'.9	14'.3
06	112° 57'.1	228° 11'.0	21'.8	321° 03'.4	01'.7	1° 46'.1	57'.4	253° 13'.1	14'.4
07	127° 59'.5	243° 10'.6	22'.4	336° 04'.4	01'.2	16° 48'.3	57'.4	268° 15'.3	14'.5
08	143° 02'.0	258° 10'.2	23'.0	351° 05'.4	00'.7	31° 50'.6	57'.3	283° 17'.5	14'.6
09	158° 04'.5	273° 09'.7	23'.6	6° 06'.4	00'.2	46° 52'.8	57'.3	298° 19'.6	14'.7
10	173° 06'.9	288° 09'.3	24'.2	21° 07'.4	12° 59'.7 N	61° 55'.1	57'.3	313° 21'.8	14'.8
11	188° 09'.4	303° 08'.9	24'.8	36° 08'.5	59'.2	76° 57'.4	57'.3	328° 24'.0	14'.9
12	203° 11'.9	318° 08'.4	24° 25'.4 S	51° 09'.5	12° 58'.7 N	91° 59'.6	21° 57'.2 N	343° 26'.2	13° 15'.0 S
13	218° 14'.3	333° 08'.0	25'.9	66° 10'.5	58'.2	107° 01'.9	57'.2	358° 28'.4	15'.1
14	233° 16'.8	348° 07'.5	26'.5	81° 11'.5	57'.7	122° 04'.2	57'.2	13° 30'.6	15'.2
15	248° 19'.3	3° 07'.1	27'.1	96° 12'.5	57'.2	137° 06'.4	57'.2	28° 32'.7	15'.2
16	263° 21'.7	18° 06'.7	27'.7	111° 13'.6	56'.7	152° 08'.7	57'.2	43° 34'.9	15'.3
17	278° 24'.2	33° 06'.2	28'.3	126° 14'.6	56'.2	167° 11'.0	57'.1	58° 37'.1	15'.4
18	293° 26'.6	48° 05'.8	28'.9	141° 15'.6	55'.7	182° 13'.2	57'.1	73° 39'.3	15'.5
19	308° 29'.1	63° 05'.3	29'.4	156° 16'.6	55'.2	197° 15'.5	57'.1	88° 41'.5	15'.6
20	323° 31'.6	78° 04'.9	30'.0	171° 17'.6	54'.7	212° 17'.8	57'.1	103° 43'.7	15'.7
21	338° 34'.0	93° 04'.5	30'.6	186° 18'.7	54'.2	227° 20'.0	57'.0	118° 45'.8	15'.8
22	353° 36'.5	108° 04'.0	31'.2	201° 19'.7	53'.7	242° 22'.3	57'.0	133° 48'.0	15'.9
23	8° 39'.0	123° 03'.6	31'.8	216° 20'.7	53'.2	257° 24'.6	57'.0	148° 50'.2	16'.0
15 Tuesday 00	23° 41'.4	138° 03'.2	24° 32'.3 S	231° 21'.7	12° 52'.7 N	272° 26'.8	21° 57'.0 N	163° 52'.4	13° 16'.1 S
01	38° 43'.9	153° 02'.7	32'.9	246° 22'.7	52'.1	287° 29'.1	57'.0	178° 54'.6	16'.2
02	53° 46'.4	168° 02'.3	33'.5	261° 23'.8	51'.6	302° 31'.4	56'.9	193° 56'.8	16'.3
03	68° 48'.8	183° 01'.8	34'.1	276° 24'.8	51'.1	317° 33'.6	56'.9	208° 58'.9	16'.3
04	83° 51'.3	198° 01'.4	34'.6	291° 25'.8	50'.6	332° 35'.9	56'.9	224° 01'.1	16'.4
05	98° 53'.7	213° 01'.0	35'.2	306° 26'.8	50'.1	347° 38'.2	56'.9	239° 03'.3	16'.5
06	113° 56'.2	228° 00'.5	35'.8	321° 27'.9	49'.6	2° 40'.4	56'.8	254° 05'.5	16'.6
07	128° 58'.7	243° 00'.1	36'.3	336° 28'.9	49'.1	17° 42'.7	56'.8	269° 07'.7	16'.7
08	144° 01'.1	257° 59'.6	36'.9	351° 29'.9	48'.6	32° 45'.0	56'.8	284° 09'.9	16'.8
09	159° 03'.6	272° 59'.2	37'.5	6° 30'.9	48'.1	47° 47'.2	56'.8	299° 12'.0	16'.9
10	174° 06'.1	287° 58'.8	38'.0	21° 31'.9	47'.6	62° 49'.5	56'.8	314° 14'.2	17'.0
11	189° 08'.5	302° 58'.3	38'.6	36° 33'.0	47'.1	77° 51'.8	56'.7	329° 16'.4	17'.1
12	204° 11'.0	317° 57'.9	24° 39'.2 S	51° 34'.0	12° 46'.6 N	92° 54'.1	21° 56'.7 N	344° 18'.6	13° 17'.2 S
13	219° 13'.5	332° 57'.4	39'.7	66° 35'.0	46'.1	107° 56'.3	56'.7	359° 20'.8	17'.3
14	234° 15'.9	347° 57'.0	40'.3	81° 36'.0	45'.6	122° 58'.6	56'.7	14° 23'.0	17'.4
15	249° 18'.4	2° 56'.6	40'.8	96° 37'.1	45'.1	138° 00'.9	56'.7	29° 25'.1	17'.4
16	264° 20'.9	17° 56'.1	41'.4	111° 38'.1	44'.6	153° 03'.1	56'.6	44° 27'.3	17'.5
17	279° 23'.3	32° 55'.7	42'.0	126° 39'.1	44'.1	168° 05'.4	56'.6	59° 29'.5	17'.6
18	294° 25'.8	47° 55'.2	42'.5	141° 40'.1	43'.5	183° 07'.7	56'.6	74° 31'.7	17'.7
19	309° 28'.2	62° 54'.8	43'.1	156° 41'.2	43'.0	198° 10'.0	56'.6	89° 33'.9	17'.8
20	324° 30'.7	77° 54'.4	43'.6	171° 42'.2	42'.5	213° 12'.2	56'.5	104° 36'.1	17'.9
21	339° 33'.2	92° 53'.9	44'.2	186° 43'.2	42'.0	228° 14'.5	56'.5	119° 38'.2	18'.0
22	354° 35'.6	107° 53'.5	44'.7	201° 44'.2	41'.5	243° 16'.8	56'.5	134° 40'.4	18'.1
23	9° 38'.1	122° 53'.1	45'.3	216° 45'.3	41'.0	258° 19'.1	56'.5	149° 42'.6	18'.2
	M.P. 22:25	v -0'.4	d 0'.6	v 1'.0	d 0'.5	v 2'.3	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 14'.9 S
Achernar	335° 26'.1	57° 09'.9 S
Acrux	173° 09'.7	63° 10'.4 S
Adhara	255° 12'.3	28° 59'.4 S
Aldebaran	290° 48'.9	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.1 N
Alkaid	152° 59'.2	49° 14'.8 N
Alnair	27° 43'.2	46° 53'.6 S
Alnilam	275° 46'.0	1° 11'.6 S
Alphard	217° 56'.0	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 08'.0	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.1	69° 03'.2 S
Avior	234° 18'.0	59° 33'.0 S
Bellatrix	278° 31'.6	6° 21'.7 N
Betelgeuse	271° 00'.9	7° 24'.5 N
Canopus	263° 55'.9	52° 42'.0 S
Capella	280° 33'.8	46° 00'.4 N
Deneb	49° 31'.2	45° 20'.2 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 55'.3	17° 54'.5 S
Dubhe	193° 52'.0	61° 40'.4 N
Elnath	278° 12'.1	28° 37'.0 N
Eltanin	90° 46'.2	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.8 S
Gacrux	172° 01'.1	57° 11'.3 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.3 S
Hamal	328° 00'.1	23° 31'.7 N
Kaus Aust.	83° 43'.6	34° 22'.6 S
Kochab	137° 21'.2	74° 06'.1 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.2 S
Miaplacidus	221° 39'.9	69° 46'.3 S
Mirfak	308° 39'.6	49° 54'.5 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 18'.8	56° 41'.4 S
Polaris	317° 14'.5	89° 19'.2 N
Pollux	243° 27'.5	27° 59'.3 N
Procyon	244° 59'.5	5° 11'.3 N
Rasalhague	96° 06'.4	12° 33'.3 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 11'.7	8° 11'.1 S
Rigil Kent	139° 51'.9	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.6	56° 36'.9 N
Shaula	96° 21'.8	37° 06'.7 S
Sirius	258° 33'.4	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.4	43° 29'.2 S
Vega	80° 38'.9	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	115° 31'.4	14:48
Mars	208° 15'.0	08:36
Jupiter	248° 50'.2	05:53
Saturn	140° 17'.7	13:06

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 25'.3	7° 45'.0 S	77° 07'.6	8'.1	14° 15'.3 S	8'.3	59'.1
198° 25'.4	46'.0	91° 34'.7	8'.2	07'.0	8'.4	
213° 25'.6	46'.9	106° 01'.9	8'.2	13° 58'.6 S	8'.4	
228° 25'.7	47'.8	120° 29'.1	8'.3	50'.2	8'.5	
243° 25'.9	48'.8	134° 56'.4	8'.3	41'.7	8'.6	
258° 26'.1	49'.7	149° 23'.7	8'.4	33'.1	8'.7	
273° 26'.2	50'.6	163° 51'.1	8'.4	24'.4	8'.8	
288° 26'.4	51'.6	178° 18'.5	8'.5	15'.6	8'.8	
303° 26'.5	52'.5	192° 46'.0	8'.5	06'.8	8'.9	
318° 26'.7	53'.4	207° 13'.5	8'.5	12° 57'.9 S	9'.0	
333° 26'.8	54'.4	221° 41'.0	8'.7	48'.9	9'.1	
348° 27'.0	55'.3	236° 08'.7	8'.6	39'.8	9'.1	
3° 27'.1	7° 56'.2 S	250° 36'.3	8'.7	12° 30'.7 S	9'.2	59'.0
18° 27'.2	57'.1	265° 04'.0	8'.8	21'.5	9'.3	
33° 27'.4	58'.1	279° 31'.8	8'.8	12'.2	9'.4	
48° 27'.5	59'.0	293° 59'.6	8'.9	02'.8	9'.4	
63° 27'.7	59'.9	308° 27'.5	8'.9	11° 53'.4 S	9'.5	
78° 27'.8	8° 00'.9 S	322° 55'.4	8'.9	43'.9	9'.6	
93° 28'.0	01'.8	337° 23'.3	9'.0	34'.3	9'.6	
108° 28'.1	02'.7	351° 51'.3	9'.1	24'.7	9'.7	
123° 28'.3	03'.7	6° 19'.4	9'.1	15'.0	9'.7	
138° 28'.4	04'.6	20° 47'.5	9'.1	05'.3	9'.8	
153° 28'.6	05'.5	35° 15'.6	9'.2	10° 55'.5 S	9'.9	
168° 28'.7	06'.5	49° 43'.8	9'.3	45'.6	9'.9	58'.9
183° 28'.9	8° 07'.4 S	64° 12'.1	9'.3	10° 35'.7 S	10'.0	58'.9
198° 29'.0	08'.3	78° 40'.4	9'.3	25'.7	10'.1	
213° 29'.2	09'.2	93° 08'.7	9'.4	15'.6	10'.1	
228° 29'.3	10'.2	107° 37'.1	9'.4	05'.5	10'.2	
243° 29'.5	11'.1	122° 05'.5	9'.5	9° 55'.3 S	10'.2	
258° 29'.6	12'.0	136° 34'.0	9'.5	45'.1	10'.2	
273° 29'.7	13'.0	151° 02'.5	9'.5	34'.9	10'.4	
288° 29'.9	13'.9	165° 31'.0	9'.6	24'.5	10'.3	
303° 30'.0	14'.8	179° 59'.6	9'.7	14'.2	10'.5	
318° 30'.2	15'.7	194° 28'.3	9'.7	03'.7	10'.4	58'.8
333° 30'.3	16'.7	208° 57'.0	9'.7	8° 53'.3 S	10'.5	
348° 30'.5	17'.6	223° 25'.7	9'.8	42'.8	10'.6	
3° 30'.6	8° 18'.5 S	237° 54'.5	9'.8	8° 32'.2 S	10'.6	58'.8
18° 30'.8	19'.5	252° 23'.3	9'.8	21'.6	10'.7	
33° 30'.9	20'.4	266° 52'.1	9'.9	10'.9	10'.7	
48° 31'.0	21'.3	281° 21'.0	9'.9	00'.2	10'.7	
63° 31'.2	22'.2	295° 49'.9	10'.0	7° 49'.5 S	10'.8	
78° 31'.3	23'.2	310° 18'.9	10'.0	38'.7	10'.8	
93° 31'.5	24'.1	324° 47'.9	10'.1	27'.9	10'.9	58'.7
108° 31'.6	25'.0	339° 17'.0	10'.1	17'.0	10'.8	
123° 31'.8	25'.9	353° 46'.1	10'.1	06'.2	11'.0	
138° 31'.9	26'.9	8° 15'.2	10'.2	6° 55'.2 S	10'.9	
153° 32'.0	27'.8	22° 44'.4	10'.2	44'.3	11'.0	
168° 32'.2	28'.7	37° 13'.6	10'.2	33'.3	11'.1	
183° 32'.3	8° 29'.6 S	51° 42'.8	10'.3	6° 22'.2 S	11'.0	58'.7
198° 32'.5	30'.6	66° 12'.1	10'.3	11'.2	11'.1	
213° 32'.6	31'.5	80° 41'.4	10'.3	00'.1	11'.1	58'.6
228° 32'.7	32'.4	95° 10'.7	10'.4	5° 49'.0 S	11'.2	
243° 32'.9	33'.3	109° 40'.1	10'.4	37'.8	11'.2	
258° 33'.0	34'.3	124° 09'.5	10'.5	26'.6	11'.2	
273° 33'.2	35'.2	138° 39'.0	10'.5	15'.4	11'.2	
288° 33'.3	36'.1	153° 08'.5	10'.5	04'.2	11'.2	
303° 33'.4	37'.0	167° 38'.0	10'.5	4° 53'.0 S	11'.3	
318° 33'.6	38'.0	182° 07'.5	10'.6	41'.7	11'.3	58'.5
333° 33'.7	38'.9	196° 37'.1	10'.6	30'.4	11'.3	
348° 33'.8	39'.8	211° 06'.7	10'.6	19'.1	11'.3	
3° 34'.0	8° 40'.7 S	225° 36'.3	10'.7	4° 07'.8 S	11'.4	58'.5
18° 34'.1	41'.6	240° 06'.0	10'.7	3° 56'.4 S	11'.3	
33° 34'.3	42'.6	254° 35'.7	10'.7	45'.1	11'.4	
48° 34'.4	43'.5	269° 05'.4	10'.7	33'.7	11'.4	
63° 34'.5	44'.4	283° 35'.1	10'.8	22'.3	11'.4	58'.4
78° 34'.7	45'.3	298° 04'.9	10'.8	10'.9	11'.4	
93° 34'.8	46'.3	312° 34'.7	10'.8	2° 59'.5 S	11'.5	
108° 34'.9	47'.2	327° 04'.5	10'.9	48'.0	11'.4	
123° 35'.1	48'.1	341° 34'.4	10'.9	36'.6	11'.4	
138° 35'.2	49'.0	356° 04'.3	10'.9	25'.2	11'.5	
153° 35'.4	49'.9	10° 34'.2	10'.9	13'.7	11'.5	
168° 35'.5	50'.9	25° 04'.1	11'.0	02'.2	11'.4	58'.3
SD 16'.0	d 0'.9	SD	16'.1	16'.0	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 13	Moonrise 14	Moonrise 15
N 72°	04:51	06:10	07:20	16:10	15:59	15:49
N 70°	04:56	06:06	07:09	15:50	15:47	15:45
68°	04:59	06:03	07:00	15:34	15:38	15:41
66°	05:02	06:01	06:53	15:20	15:30	15:37
64°	05:04	05:59	06:47	15:09	15:23	15:35
62°	05:05	05:57	06:42	15:00	15:17	15:32
60°	05:07	05:55	06:37	14:52	15:12	15:30
N 58°	05:08	05:53	06:33	14:45	15:08	15:28
56°	05:09	05:52	06:29	14:39	15:04	15:26
54°	05:09	05:50	06:26	14:33	15:00	15:25
52°	05:10	05:49	06:23	14:28	14:57	15:23
50°	05:10	05:48	06:20	14:23	14:54	15:22
45°	05:11	05:45	06:14	14:13	14:47	15:19
N 40°	05:11	05:42	06:09	14:05	14:42	15:17
35°	05:10	05:40	06:05	13:57	14:37	15:15
30°	05:09	05:37	06:01	13:51	14:33	15:13
20°	05:07	05:32	05:54	13:40	14:26	15:10
N 10°	05:03	05:27	05:48	13:30	14:20	15:07
0°	04:58	05:22	05:43	13:21	14:14	15:04
S 10°	04:51	05:16	05:37	13:12	14:08	15:02
20°	04:42	05:08	05:30	13:02	14:01	14:59
30°	04:30	04:59	05:23	12:51	13:54	14:56
35°	04:22	04:53	05:19	12:45	13:50	14:54
40°	04:13	04:46	05:14	12:37	13:45	14:52
45°	04:01	04:38	05:08	12:29	13:39	14:50
S 50°	03:47	04:28	05:01	12:18	13:33	14:47
52°	03:39	04:23	04:58	12:13	13:30	14:46
54°	03:31	04:17	04:54	12:08	13:26	14:44
56°	03:22	04:11	04:51	12:02	13:22	14:43
58°	03:11	04:04	04:46	11:55	13:18	14:41
S 60°	02:58	03:56	04:41	11:48	13:13	14:39
S 62°	02:43	03:47	04:36	11:39	13:08	14:37

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 13	Moonset 14	Moonset 15
N 72°	16:10	17:20	18:38	23:17	-	01:16
N 70°	16:21	17:24	18:34	23:36	-	01:26
68°	16:30	17:27	18:31	23:50	-	01:34
66°	16:37	17:29	18:28	-	00:02	01:40
64°	16:44	17:32	18:27	-	00:12	01:45
62°	16:49	17:34	18:25	-	00:21	01:50
60°	16:54	17:36	18:24	-	00:28	01:54
N 58°	16:58	17:37	18:23	-	00:34	01:57
56°	17:02	17:39	18:22	-	00:40	02:00
54°	17:05	17:41	18:21	-	00:45	02:03
52°	17:08	17:42	18:21	-	00:49	02:06
50°	17:11	17:43	18:21	-	00:53	02:08
45°	17:17	17:46	18:20	-	01:02	02:13
N 40°	17:22	17:49	18:20	00:01	01:09	02:17
35°	17:26	17:52	18:21	00:10	01:16	02:21
30°	17:30	17:54	18:22	00:18	01:21	02:24
20°	17:37	17:59	18:25	00:31	01:31	02:29
N 10°	17:43	18:05	18:29	00:42	01:39	02:34
0°	17:49	18:10	18:34	00:53	01:46	02:38
S 10°	17:55	18:17	18:41	01:03	01:54	02:42
20°	18:02	18:24	18:50	01:15	02:02	02:47
30°	18:09	18:34	19:03	01:27	02:11	02:52
35°	18:14	18:40	19:10	01:35	02:16	02:55
40°	18:19	18:47	19:20	01:43	02:22	02:58
45°	18:25	18:55	19:32	01:52	02:29	03:02
S 50°	18:32	19:06	19:47	02:04	02:37	03:06
52°	18:35	19:11	19:54	02:09	02:41	03:08
54°	18:39	19:16	20:03	02:15	02:45	03:11
56°	18:43	19:22	20:12	02:22	02:49	03:13
58°	18:47	19:29	20:23	02:29	02:54	03:16
S 60°	18:52	19:37	20:36	02:37	03:00	03:19
S 62°	18:58	19:47	20:52	02:47	03:06	03:22

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
13	13 41	13 48	11:46	19:34	07:07	8d 67%
14	13 55	14 02	11:46	20:26	08:00	9d 77%
15	14 09	14 16	11:46	21:16	08:51	10d 86%

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2013 October 16, 17, 18 (Wed, Thur, Fri)

GMT	ARIES	VENUS -4.3		MARS +1.6		JUPITER -2.3		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
16 Wednesday 00	24° 40'.6	137° 52'.6	24° 45'.8 S	231° 46'.3	12° 40'.5 N	273° 21'.3	21° 56'.5 N	164° 44'.8	13° 18'.3 S
01	39° 43'.0	152° 52'.2	46'.4	246° 47'.3	40'.0	288° 23'.6	56'.4	179° 47'.0	18'.4
02	54° 45'.5	167° 51'.7	46'.9	261° 48'.3	39'.5	303° 25'.9	56'.4	194° 49'.2	18'.5
03	69° 48'.0	182° 51'.3	47'.5	276° 49'.4	39'.0	318° 28'.2	56'.4	209° 51'.3	18'.5
04	84° 50'.4	197° 50'.9	48'.0	291° 50'.4	38'.5	333° 30'.4	56'.4	224° 53'.5	18'.6
05	99° 52'.9	212° 50'.4	48'.6	306° 51'.4	38'.0	348° 32'.7	56'.4	239° 55'.7	18'.7
06	114° 55'.4	227° 50'.0	49'.1	321° 52'.4	37'.5	3° 35'.0	56'.3	254° 57'.9	18'.8
07	129° 57'.8	242° 49'.5	49'.7	336° 53'.5	37'.0	18° 37'.3	56'.3	270° 00'.1	18'.9
08	145° 00'.3	257° 49'.1	50'.2	351° 54'.5	36'.4	33° 39'.5	56'.3	285° 02'.2	19'.0
09	160° 02'.7	272° 48'.7	50'.8	6° 55'.5	35'.9	48° 41'.8	56'.3	300° 04'.4	19'.1
10	175° 05'.2	287° 48'.2	51'.3	21° 56'.6	35'.4	63° 44'.1	56'.3	315° 06'.6	19'.2
11	190° 07'.7	302° 47'.8	51'.8	36° 57'.6	34'.9	78° 46'.4	56'.2	330° 08'.8	19'.3
12	205° 10'.1	317° 47'.3	24° 52'.4 S	51° 58'.6	12° 34'.4 N	93° 48'.7	21° 56'.2 N	345° 11'.0	13° 19'.4 S
13	220° 12'.6	332° 46'.9	52'.9	66° 59'.6	33'.9	108° 50'.9	56'.2	0° 13'.2	19'.5
14	235° 15'.1	347° 46'.5	53'.5	82° 00'.7	33'.4	123° 53'.2	56'.2	15° 15'.3	19'.6
15	250° 17'.5	2° 46'.0	54'.0	97° 01'.7	32'.9	138° 55'.5	56'.2	30° 17'.5	19'.6
16	265° 20'.0	17° 45'.6	54'.5	112° 02'.7	32'.4	153° 57'.8	56'.1	45° 19'.7	19'.7
17	280° 22'.5	32° 45'.1	55'.1	127° 03'.8	31'.9	169° 00'.1	56'.1	60° 21'.9	19'.8
18	295° 24'.9	47° 44'.7	55'.6	142° 04'.8	31'.4	184° 02'.3	56'.1	75° 24'.1	19'.9
19	310° 27'.4	62° 44'.3	56'.1	157° 05'.8	30'.9	199° 04'.6	56'.1	90° 26'.2	20'.0
20	325° 29'.8	77° 43'.8	56'.7	172° 06'.8	30'.4	214° 06'.9	56'.1	105° 28'.4	20'.1
21	340° 32'.3	92° 43'.4	57'.2	187° 07'.9	29'.8	229° 09'.2	56'.0	120° 30'.6	20'.2
22	355° 34'.8	107° 43'.0	57'.7	202° 08'.9	29'.3	244° 11'.5	56'.0	135° 32'.8	20'.3
23	10° 37'.2	122° 42'.5	58'.3	217° 09'.9	28'.8	259° 13'.8	56'.0	150° 35'.0	20'.4
17 Thursday 00	25° 39'.7	137° 42'.1	24° 58'.8 S	232° 11'.0	12° 28'.3 N	274° 16'.0	21° 56'.0 N	165° 37'.2	13° 20'.5 S
01	40° 42'.2	152° 41'.6	59'.3	247° 12'.0	27'.8	289° 18'.3	56'.0	180° 39'.3	20'.6
02	55° 44'.6	167° 41'.2	59'.8	262° 13'.0	27'.3	304° 20'.6	55'.9	195° 41'.5	20'.6
03	70° 47'.1	182° 40'.8	25° 00'.4 S	277° 14'.1	26'.8	319° 22'.9	55'.9	210° 43'.7	20'.7
04	85° 49'.6	197° 40'.3	00'.9	292° 15'.1	26'.3	334° 25'.2	55'.9	225° 45'.9	20'.8
05	100° 52'.0	212° 39'.9	01'.4	307° 16'.1	25'.8	349° 27'.5	55'.9	240° 48'.1	20'.9
06	115° 54'.5	227° 39'.4	01'.9	322° 17'.2	25'.3	4° 29'.7	55'.9	255° 50'.2	21'.0
07	130° 57'.0	242° 39'.0	02'.4	337° 18'.2	24'.8	19° 32'.0	55'.8	270° 52'.4	21'.1
08	145° 59'.4	257° 38'.6	03'.0	352° 19'.2	24'.2	34° 34'.3	55'.8	285° 54'.6	21'.2
09	161° 01'.9	272° 38'.1	03'.5	7° 20'.3	23'.7	49° 36'.6	55'.8	300° 56'.8	21'.3
10	176° 04'.3	287° 37'.7	04'.0	22° 21'.3	23'.2	64° 38'.9	55'.8	315° 59'.0	21'.4
11	191° 06'.8	302° 37'.2	04'.5	37° 22'.3	22'.7	79° 41'.2	55'.8	331° 01'.1	21'.5
12	206° 09'.3	317° 36'.8	25° 05'.0 S	52° 23'.4	12° 22'.2 N	94° 43'.5	21° 55'.7 N	346° 03'.3	13° 21'.6 S
13	221° 11'.7	332° 36'.4	05'.5	67° 24'.4	21'.7	109° 45'.7	55'.7	1° 05'.5	21'.7
14	236° 14'.2	347° 35'.9	06'.0	82° 25'.4	21'.2	124° 48'.0	55'.7	16° 07'.7	21'.7
15	251° 16'.7	2° 35'.5	06'.6	97° 26'.5	20'.7	139° 50'.3	55'.7	31° 09'.9	21'.8
16	266° 19'.1	17° 35'.1	07'.1	112° 27'.5	20'.2	154° 52'.6	55'.7	46° 12'.0	21'.9
17	281° 21'.6	32° 34'.6	07'.6	127° 28'.5	19'.7	169° 54'.9	55'.6	61° 14'.2	22'.0
18	296° 24'.1	47° 34'.2	08'.1	142° 29'.6	19'.1	184° 57'.2	55'.6	76° 16'.4	22'.1
19	311° 26'.5	62° 33'.7	08'.6	157° 30'.6	18'.6	199° 59'.5	55'.6	91° 18'.6	22'.2
20	326° 29'.0	77° 33'.3	09'.1	172° 31'.6	18'.1	215° 01'.8	55'.6	106° 20'.8	22'.3
21	341° 31'.4	92° 32'.9	09'.6	187° 32'.7	17'.6	230° 04'.1	55'.6	121° 23'.0	22'.4
22	356° 33'.9	107° 32'.4	10'.1	202° 33'.7	17'.1	245° 06'.3	55'.5	136° 25'.1	22'.5
23	11° 36'.4	122° 32'.0	10'.6	217° 34'.7	16'.6	260° 08'.6	55'.5	151° 27'.3	22'.6
18 Friday 00	26° 38'.8	137° 31'.5	25° 11'.1 S	232° 35'.8	12° 16'.1 N	275° 10'.9	21° 55'.5 N	166° 29'.5	13° 22'.7 S
01	41° 41'.3	152° 31'.1	11'.6	247° 36'.8	15'.6	290° 13'.2	55'.5	181° 31'.7	22'.8
02	56° 43'.8	167° 30'.7	12'.1	262° 37'.8	15'.1	305° 15'.5	55'.5	196° 33'.9	22'.8
03	71° 46'.2	182° 30'.2	12'.6	277° 38'.9	14'.6	320° 17'.8	55'.4	211° 36'.0	22'.9
04	86° 48'.7	197° 29'.8	13'.1	292° 39'.9	14'.0	335° 20'.1	55'.4	226° 38'.2	23'.0
05	101° 51'.2	212° 29'.4	13'.6	307° 40'.9	13'.5	350° 22'.4	55'.4	241° 40'.4	23'.1
06	116° 53'.6	227° 28'.9	14'.1	322° 42'.0	13'.0	5° 24'.7	55'.4	256° 42'.6	23'.2
07	131° 56'.1	242° 28'.5	14'.6	337° 43'.0	12'.5	20° 27'.0	55'.4	271° 44'.8	23'.3
08	146° 58'.6	257° 28'.0	15'.1	352° 44'.0	12'.0	35° 29'.3	55'.4	286° 46'.9	23'.4
09	162° 01'.0	272° 27'.6	15'.6	7° 45'.1	11'.5	50° 31'.6	55'.3	301° 49'.1	23'.5
10	177° 03'.5	287° 27'.2	16'.1	22° 46'.1	11'.0	65° 33'.8	55'.3	316° 51'.3	23'.6
11	192° 05'.9	302° 26'.7	16'.6	37° 47'.2	10'.5	80° 36'.1	55'.3	331° 53'.5	23'.7
12	207° 08'.4	317° 26'.3	25° 17'.1 S	52° 48'.2	12° 10'.0 N	95° 38'.4	21° 55'.3 N	346° 55'.7	13° 23'.8 S
13	222° 10'.9	332° 25'.9	17'.6	67° 49'.2	09'.4	110° 40'.7	55'.3	1° 57'.8	23'.9
14	237° 13'.3	347° 25'.4	18'.0	82° 50'.3	08'.9	125° 43'.0	55'.2	17° 00'.0	23'.9
15	252° 15'.8	2° 25'.0	18'.5	97° 51'.3	08'.4	140° 45'.3	55'.2	32° 02'.2	24'.0
16	267° 18'.3	17° 24'.5	19'.0	112° 52'.3	07'.9	155° 47'.6	55'.2	47° 04'.4	24'.1
17	282° 20'.7	32° 24'.1	19'.5	127° 53'.4	07'.4	170° 49'.9	55'.2	62° 06'.6	24'.2
18	297° 23'.2	47° 23'.7	20'.0	142° 54'.4	06'.9	185° 52'.2	55'.2	77° 08'.7	24'.3
19	312° 25'.7	62° 23'.2	20'.5	157° 55'.5	06'.4	200° 54'.5	55'.2	92° 10'.9	24'.4
20	327° 28'.1	77° 22'.8	20'.9	172° 56'.5	05'.9	215° 56'.8	55'.1	107° 13'.1	24'.5
21	342° 30'.6	92° 22'.4	21'.4	187° 57'.5	05'.4	230° 59'.1	55'.1	122° 15'.3	24'.6
22	357° 33'.0	107° 21'.9	21'.9	202° 58'.6	04'.8	246° 01'.4	55'.1	137° 17'.4	24'.7
23	12° 35'.5	122° 21'.5	22'.4	217° 59'.6	04'.3	261° 03'.7	55'.1	152° 19'.6	24'.8
	M.P. 22:14	v -0'.4	d 0'.5	v 1'.0	d 0'.5	v 2'.3	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 14'.9 S
Achernar	335° 26'.1	57° 10'.0 S
Acrux	173° 09'.7	63° 10'.4 S
Adhara	255° 12'.3	28° 59'.4 S
Aldebaran	290° 48'.9	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.1 N
Alkaid	152° 59'.2	49° 14'.8 N
Alnair	27° 43'.2	46° 53'.6 S
Alnilam	275° 46'.0	1° 11'.6 S
Alphard	217° 56'.0	8° 43'.1 S
Alphecca	126° 11'.1	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 08'.0	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.2	69° 03'.1 S
Avior	234° 18'.0	59° 33'.0 S
Bellatrix	278° 31'.6	6° 21'.7 N
Betelgeuse	271° 00'.9	7° 24'.5 N
Canopus	263° 55'.9	52° 42'.0 S
Capella	280° 33'.8	46° 00'.4 N
Deneb	49° 31'.2	45° 20'.2 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.0	61° 40'.4 N
Elnath	278° 12'.1	28° 37'.0 N
Eltanin	90° 46'.3	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.8 S
Gacrux	172° 01'.1	57° 11'.3 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.3 S
Hamal	328° 00'.1	23° 31'.7 N
Kaus Aust.	83° 43'.6	34° 22'.6 S
Kochab	137° 21'.2	74° 06'.1 N
Markab	13° 37'.8	15° 17'.0 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.1 S
Miaplacidus	221° 39'.9	69° 46'.2 S
Mirfak	308° 39'.5	49° 54'.5 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 18'.8	56° 41'.4 S
Polaris	317° 13'.9	89° 19'.3 N
Pollux	243° 27'.5	27° 59'.3 N
Procyon	244° 59'.5	5° 11'.3 N
Rasalhague	96° 06'.4	12° 33'.3 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 11'.6	8° 11'.1 S
Rigil Kent	139° 52'.0	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.6	56° 37'.0 N
Shaula	96° 21'.8	37° 06'.7 S
Sirius	258° 33'.4	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.4	43° 29'.2 S
Vega	80° 38'.9	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	112° 02'.4	14:50
Mars	206° 31'.3	08:31
Jupiter	248° 36'.3	05:42
Saturn	139° 57'.4	12:56

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 35'.6	8° 51'.8 S	39° 34'.1	10'.9	1° 50'.8 S	11'.5	58'.3
198° 35'.8	52'.7	54° 04'.0	11'.0	39'.3	11'.5	
213° 35'.9	53'.6	68° 34'.0	11'.0	27'.8	11'.4	
228° 36'.0	54'.5	83° 04'.0	11'.1	16'.4	11'.5	
243° 36'.2	55'.5	97° 34'.1	11'.0	04'.9	11'.5	
258° 36'.3	56'.4	112° 04'.1	11'.1	0° 53'.4 S	11'.5	58'.2
273° 36'.4	57'.3	126° 34'.2	11'.1	41'.9	11'.5	
288° 36'.6	58'.2	141° 04'.3	11'.1	30'.4	11'.4	
303° 36'.7	59'.1	155° 34'.4	11'.1	19'.0	11'.5	
318° 36'.8	9° 00'.0 S	170° 04'.5	11'.2	07'.5	11'.5	
333° 37'.0	01'.0	184° 34'.7	11'.2	0° 04'.0 N	11'.4	58'.1
348° 37'.1	01'.9	199° 04'.9	11'.1	15'.4	11'.5	
3° 37'.2	9° 02'.8 S	213° 35'.0	11'.2	0° 26'.9 N	11'.4	58'.1
18° 37'.4	03'.7	228° 05'.2	11'.3	38'.3	11'.4	
33° 37'.5	04'.6	242° 35'.5	11'.2	49'.7	11'.4	
48° 37'.6	05'.5	257° 05'.7	11'.2	1° 01'.1 N	11'.4	
63° 37'.8	06'.5	271° 35'.9	11'.3	12'.5	11'.4	58'.0
78° 37'.9	07'.4	286° 06'.2	11'.2	23'.9	11'.4	
93° 38'.0	08'.3	300° 36'.4	11'.3	35'.3	11'.4	
108° 38'.1	09'.2	315° 06'.7	11'.3	46'.7	11'.3	
123° 38'.3	10'.1	329° 37'.0	11'.3	58'.0	11'.4	
138° 38'.4	11'.0	344° 07'.3	11'.3	2° 09'.4 N	11'.3	57'.9
153° 38'.5	12'.0	358° 37'.6	11'.4	20'.7	11'.3	
168° 38'.7	12'.9	13° 08'.0	11'.3	32'.0	11'.2	
183° 38'.8	9° 13'.8 S	27° 38'.3	11'.4	2° 43'.2 N	11'.3	57'.9
198° 38'.9	14'.7	42° 08'.7	11'.3	54'.5	11'.2	
213° 39'.0	15'.6	56° 39'.0	11'.4	3° 05'.7 N	11'.2	
228° 39'.2	16'.5	71° 09'.4	11'.4	16'.9	11'.2	57'.8
243° 39'.3	17'.4	85° 39'.8	11'.3	28'.1	11'.2	
258° 39'.4	18'.4	100° 10'.1	11'.4	39'.3	11'.1	
273° 39'.6	19'.3	114° 40'.5	11'.4	50'.4	11'.1	
288° 39'.7	20'.2	129° 10'.9	11'.4	4° 01'.5 N	11'.1	
303° 39'.8	21'.1	143° 41'.3	11'.4	12'.6	11'.0	57'.7
318° 39'.9	22'.0	158° 11'.7	11'.4	23'.6	11'.0	
333° 40'.1	22'.9	172° 42'.1	11'.5	34'.6	11'.0	
348° 40'.2	23'.8	187° 12'.6	11'.4	45'.6	11'.0	
3° 40'.3	9° 24'.7 S	201° 43'.0	11'.4	4° 56'.6 N	10'.9	57'.6
18° 40'.4	25'.7	216° 13'.4	11'.4	5° 07'.5 N	10'.9	
33° 40'.6	26'.6	230° 43'.8	11'.5	18'.4	10'.8	
48° 40'.7	27'.5	245° 14'.3	11'.4	29'.2	10'.8	
63° 40'.8	28'.4	259° 44'.7	11'.4	40'.0	10'.8	
78° 40'.9	29'.3	274° 15'.1	11'.5	50'.8	10'.8	57'.5
93° 41'.1	30'.2	288° 45'.6	11'.4	6° 01'.6 N	10'.7	
108° 41'.2	31'.1	303° 16'.0	11'.4	12'.3	10'.6	
123° 41'.3	32'.0	317° 46'.4	11'.5	22'.9	10'.6	
138° 41'.4	32'.9	332° 16'.9	11'.4	33'.5	10'.6	
153° 41'.6	33'.8	346° 47'.3	11'.5	44'.1	10'.5	57'.4
168° 41'.7	34'.8	1° 17'.8	11'.4	54'.6	10'.5	
183° 41'.8	9° 35'.7 S	15° 48'.2	11'.4	7° 05'.1 N	10'.5	57'.4
198° 41'.9	36'.6	30° 18'.6	11'.5	15'.6	10'.4	
213° 42'.1	37'.5	44° 49'.1	11'.4	26'.0	10'.4	57'.3
228° 42'.2	38'.4	59° 19'.5	11'.5	36'.4	10'.3	
243° 42'.3	39'.3	73° 50'.0	11'.4	46'.7	10'.2	
258° 42'.4	40'.2	88° 20'.4	11'.4	56'.9	10'.2	
273° 42'.5	41'.1	102° 50'.8	11'.5	8° 07'.1 N	10'.2	
288° 42'.7	42'.0	117° 21'.3	11'.4	17'.3	10'.1	57'.2
303° 42'.8	42'.9	131° 51'.7	11'.4	27'.4	10'.1	
318° 42'.9	43'.8	146° 22'.1	11'.4	37'.5	10'.0	
333° 43'.0	44'.7	160° 52'.5	11'.4	47'.5	9'.9	
348° 43'.1	45'.6	175° 22'.9	11'.4	57'.4	9'.9	57'.1
3° 43'.3	9° 46'.5 S	189° 53'.3	11'.5	9° 07'.3 N	9'.9	57'.1
18° 43'.4	47'.5	204° 23'.8	11'.4	17'.2	9'.8	
33° 43'.5	48'.4	218° 54'.2	11'.4	27'.0	9'.7	
48° 43'.6	49'.3	233° 24'.6	11'.3	36'.7	9'.7	
63° 43'.7	50'.2	247° 54'.9	11'.4	46'.4	9'.6	57'.0
78° 43'.9	51'.1	262° 25'.3	11'.4	56'.0	9'.6	
93° 44'.0	52'.0	276° 55'.7	11'.4	10° 05'.6 N	9'.5	
108° 44'.1	52'.9	291° 26'.1	11'.4	15'.1	9'.4	
123° 44'.2	53'.8	305° 56'.5	11'.3	24'.5	9'.4	56'.9
138° 44'.3	54'.7	320° 26'.8	11'.4	33'.9	9'.3	
153° 44'.5	55'.6	334° 57'.2	11'.3	43'.2	9'.3	
168° 44'.6	56'.5	349° 27'.5	11'.4	52'.5	9'.2	
SD 16'.1	d 0'.9	SD 15'.8		15'.7	15'.6	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 16	Moonrise 17	Moonrise 18
N 72°	05:04	06:23	07:35	15:41	15:32	15:22
N 70°	05:07	06:18	07:22	15:42	15:39	15:37
68°	05:09	06:14	07:12	15:43	15:46	15:49
66°	05:11	06:10	07:03	15:44	15:51	15:59
64°	05:12	06:07	06:56	15:45	15:55	16:07
62°	05:13	06:04	06:50	15:46	15:59	16:14
60°	05:14	06:02	06:44	15:46	16:03	16:20
N 58°	05:14	06:00	06:40	15:47	16:06	16:26
56°	05:15	05:58	06:36	15:47	16:08	16:31
54°	05:15	05:56	06:32	15:48	16:11	16:35
52°	05:15	05:54	06:28	15:48	16:13	16:39
50°	05:15	05:52	06:25	15:48	16:15	16:43
45°	05:15	05:49	06:18	15:49	16:19	16:50
N 40°	05:14	05:45	06:13	15:50	16:23	16:57
35°	05:13	05:42	06:08	15:51	16:26	17:03
30°	05:11	05:39	06:03	15:51	16:29	17:08
20°	05:07	05:33	05:55	15:52	16:34	17:17
N 10°	05:03	05:27	05:49	15:53	16:39	17:25
0°	04:57	05:21	05:42	15:54	16:43	17:32
S 10°	04:49	05:14	05:35	15:55	16:47	17:39
20°	04:39	05:06	05:28	15:56	16:52	17:47
30°	04:26	04:55	05:20	15:57	16:57	17:56
35°	04:18	04:49	05:15	15:58	17:00	18:02
40°	04:08	04:41	05:09	15:58	17:04	18:08
45°	03:55	04:32	05:03	15:59	17:08	18:15
S 50°	03:39	04:21	04:55	16:00	17:12	18:23
52°	03:32	04:16	04:51	16:01	17:15	18:27
54°	03:23	04:10	04:47	16:01	17:17	18:31
56°	03:12	04:03	04:43	16:02	17:20	18:36
58°	03:01	03:55	04:38	16:03	17:23	18:42
S 60°	02:46	03:47	04:32	16:03	17:26	18:48
S 62°	02:29	03:37	04:26	16:04	17:30	18:55

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 16	Moonset 17	Moonset 18
N 72°	15:54	17:06	18:24	03:11	05:03	06:55
N 70°	16:07	17:11	18:21	03:13	04:58	06:42
68°	16:17	17:15	18:19	03:15	04:54	06:32
66°	16:26	17:19	18:18	03:16	04:50	06:23
64°	16:33	17:22	18:17	03:17	04:47	06:16
62°	16:40	17:25	18:16	03:18	04:45	06:10
60°	16:45	17:27	18:15	03:19	04:43	06:05
N 58°	16:50	17:30	18:15	03:20	04:41	06:00
56°	16:54	17:32	18:15	03:20	04:39	05:56
54°	16:58	17:34	18:15	03:21	04:37	05:53
52°	17:01	17:36	18:15	03:21	04:36	05:49
50°	17:05	17:37	18:15	03:22	04:35	05:46
45°	17:12	17:41	18:15	03:23	04:32	05:40
N 40°	17:17	17:45	18:16	03:24	04:30	05:34
35°	17:23	17:48	18:17	03:25	04:28	05:30
30°	17:27	17:51	18:19	03:25	04:26	05:26
20°	17:35	17:57	18:23	03:26	04:23	05:18
N 10°	17:42	18:03	18:28	03:27	04:20	05:12
0°	17:49	18:10	18:34	03:28	04:17	05:06
S 10°	17:55	18:17	18:42	03:29	04:15	05:00
20°	18:03	18:25	18:52	03:30	04:12	04:54
30°	18:11	18:36	19:05	03:31	04:09	04:47
35°	18:16	18:42	19:13	03:31	04:07	04:43
40°	18:22	18:50	19:24	03:32	04:05	04:39
45°	18:29	18:59	19:36	03:33	04:03	04:33
S 50°	18:37	19:11	19:53	03:34	04:00	04:27
52°	18:40	19:16	20:01	03:34	03:59	04:24
54°	18:45	19:22	20:10	03:34	03:57	04:21
56°	18:49	19:29	20:20	03:35	03:56	04:17
58°	18:54	19:37	20:33	03:35	03:54	04:13
S 60°	19:00	19:46	20:47	03:36	03:52	04:09
S 62°	19:06	19:56	21:05	03:36	03:50	04:04

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON ◯ Age/ Vis
16	14 22	14 29	11:46	22:06	09:41	11d 93%
17	14 35	14 41	11:45	22:55	10:30	12d 97%
18	14 47	14 53	11:45	23:44	11:19	13d Full

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2013 October 19, 20, 21 (Sat, Sun, Mon)

GMT	ARIES	VENUS -4.3		MARS +1.5		JUPITER -2.3		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
19 Saturday 00	27° 38'.0	137° 21'.1	25° 22'.9 S	233° 00'.7	12° 03'.8 N	276° 06'.0	21° 55'.1 N	167° 21'.8	13° 24'.9 S
01	42° 40'.4	152° 20'.6	23'.3	248° 01'.7	03'.3	291° 08'.3	55'.0	182° 24'.0	25'.0
02	57° 42'.9	167° 20'.2	23'.8	263° 02'.7	02'.8	306° 10'.6	55'.0	197° 26'.2	25'.0
03	72° 45'.4	182° 19'.7	24'.3	278° 03'.8	02'.3	321° 12'.9	55'.0	212° 28'.3	25'.1
04	87° 47'.8	197° 19'.3	24'.8	293° 04'.8	01'.8	336° 15'.2	55'.0	227° 30'.5	25'.2
05	102° 50'.3	212° 18'.9	25'.2	308° 05'.9	01'.3	351° 17'.5	55'.0	242° 32'.7	25'.3
06	117° 52'.8	227° 18'.4	25'.7	323° 06'.9	00'.7	6° 19'.8	55'.0	257° 34'.9	25'.4
07	132° 55'.2	242° 18'.0	26'.2	338° 07'.9	00'.2	21° 22'.1	54'.9	272° 37'.1	25'.5
08	147° 57'.7	257° 17'.6	26'.6	353° 09'.0	11° 59'.7 N	36° 24'.4	54'.9	287° 39'.2	25'.6
09	163° 00'.2	272° 17'.1	27'.1	8° 10'.0	59'.2	51° 26'.7	54'.9	302° 41'.4	25'.7
10	178° 02'.6	287° 16'.7	27'.6	23° 11'.1	58'.7	66° 29'.0	54'.9	317° 43'.6	25'.8
11	193° 05'.1	302° 16'.3	28'.0	38° 12'.1	58'.2	81° 31'.3	54'.9	332° 45'.8	25'.9
12	208° 07'.5	317° 15'.8	25° 28'.5 S	53° 13'.2	11° 57'.7 N	96° 33'.6	21° 54'.8 N	347° 48'.0	13° 26'.0 S
13	223° 10'.0	332° 15'.4	29'.0	68° 14'.2	57'.2	111° 35'.9	54'.8	2° 50'.1	26'.1
14	238° 12'.5	347° 15'.0	29'.4	83° 15'.2	56'.6	126° 38'.2	54'.8	17° 52'.3	26'.1
15	253° 14'.9	2° 14'.5	29'.9	98° 16'.3	56'.1	141° 40'.5	54'.8	32° 54'.5	26'.2
16	268° 17'.4	17° 14'.1	30'.4	113° 17'.3	55'.6	156° 42'.8	54'.8	47° 56'.7	26'.3
17	283° 19'.9	32° 13'.6	30'.8	128° 18'.4	55'.1	171° 45'.1	54'.8	62° 58'.8	26'.4
18	298° 22'.3	47° 13'.2	31'.3	143° 19'.4	54'.6	186° 47'.4	54'.7	78° 01'.0	26'.5
19	313° 24'.8	62° 12'.8	31'.7	158° 20'.5	54'.1	201° 49'.7	54'.7	93° 03'.2	26'.6
20	328° 27'.3	77° 12'.3	32'.2	173° 21'.5	53'.6	216° 52'.0	54'.7	108° 05'.4	26'.7
21	343° 29'.7	92° 11'.9	32'.6	188° 22'.5	53'.0	231° 54'.4	54'.7	123° 07'.6	26'.8
22	358° 32'.2	107° 11'.5	33'.1	203° 23'.6	52'.5	246° 56'.7	54'.7	138° 09'.7	26'.9
23	13° 34'.7	122° 11'.0	33'.5	218° 24'.6	52'.0	261° 59'.0	54'.7	153° 11'.9	27'.0
20 Sunday 00	28° 37'.1	137° 10'.6	25° 34'.0 S	233° 25'.7	11° 51'.5 N	277° 01'.3	21° 54'.6 N	168° 14'.1	13° 27'.1 S
01	43° 39'.6	152° 10'.2	34'.5	248° 26'.7	51'.0	292° 03'.6	54'.6	183° 16'.3	27'.2
02	58° 42'.0	167° 09'.7	34'.9	263° 27'.8	50'.5	307° 05'.9	54'.6	198° 18'.5	27'.2
03	73° 44'.5	182° 09'.3	35'.4	278° 28'.8	50'.0	322° 08'.2	54'.6	213° 20'.6	27'.3
04	88° 47'.0	197° 08'.9	35'.8	293° 29'.9	49'.5	337° 10'.5	54'.6	228° 22'.8	27'.4
05	103° 49'.4	212° 08'.4	36'.2	308° 30'.9	48'.9	352° 12'.8	54'.6	243° 25'.0	27'.5
06	118° 51'.9	227° 08'.0	36'.7	323° 31'.9	48'.4	7° 15'.1	54'.5	258° 27'.2	27'.6
07	133° 54'.4	242° 07'.6	37'.1	338° 33'.0	47'.9	22° 17'.4	54'.5	273° 29'.3	27'.7
08	148° 56'.8	257° 07'.1	37'.6	353° 34'.0	47'.4	37° 19'.7	54'.5	288° 31'.5	27'.8
09	163° 59'.3	272° 06'.7	38'.0	8° 35'.1	46'.9	52° 22'.1	54'.5	303° 33'.7	27'.9
10	179° 01'.8	287° 06'.3	38'.5	23° 36'.1	46'.4	67° 24'.4	54'.5	318° 35'.9	28'.0
11	194° 04'.2	302° 05'.8	38'.9	38° 37'.2	45'.9	82° 26'.7	54'.5	333° 38'.1	28'.1
12	209° 06'.7	317° 05'.4	25° 39'.3 S	53° 38'.2	11° 45'.3 N	97° 29'.0	21° 54'.4 N	348° 40'.2	13° 28'.2 S
13	224° 09'.1	332° 05'.0	39'.8	68° 39'.3	44'.8	112° 31'.3	54'.4	3° 42'.4	28'.3
14	239° 11'.6	347° 04'.5	40'.2	83° 40'.3	44'.3	127° 33'.6	54'.4	18° 44'.6	28'.3
15	254° 14'.1	2° 04'.1	40'.7	98° 41'.4	43'.8	142° 35'.9	54'.4	33° 46'.8	28'.4
16	269° 16'.5	17° 03'.7	41'.1	113° 42'.4	43'.3	157° 38'.2	54'.4	48° 48'.9	28'.5
17	284° 19'.0	32° 03'.2	41'.5	128° 43'.5	42'.8	172° 40'.5	54'.4	63° 51'.1	28'.6
18	299° 21'.5	47° 02'.8	42'.0	143° 44'.5	42'.3	187° 42'.9	54'.3	78° 53'.3	28'.7
19	314° 23'.9	62° 02'.4	42'.4	158° 45'.6	41'.7	202° 45'.2	54'.3	93° 55'.5	28'.8
20	329° 26'.4	77° 01'.9	42'.8	173° 46'.6	41'.2	217° 47'.5	54'.3	108° 57'.7	28'.9
21	344° 28'.9	92° 01'.5	43'.3	188° 47'.6	40'.7	232° 49'.8	54'.3	123° 59'.8	29'.0
22	359° 31'.3	107° 01'.1	43'.7	203° 48'.7	40'.2	247° 52'.1	54'.3	139° 02'.0	29'.1
23	14° 33'.8	122° 00'.7	44'.1	218° 49'.7	39'.7	262° 54'.4	54'.3	154° 04'.2	29'.2
21 Monday 00	29° 36'.3	137° 00'.2	25° 44'.5 S	233° 50'.8	11° 39'.2 N	277° 56'.7	21° 54'.3 N	169° 06'.4	13° 29'.3 S
01	44° 38'.7	151° 59'.8	45'.0	248° 51'.8	38'.6	292° 59'.1	54'.2	184° 08'.5	29'.4
02	59° 41'.2	166° 59'.4	45'.4	263° 52'.9	38'.1	308° 01'.4	54'.2	199° 10'.7	29'.4
03	74° 43'.6	181° 58'.9	45'.8	278° 53'.9	37'.6	323° 03'.7	54'.2	214° 12'.9	29'.5
04	89° 46'.1	196° 58'.5	46'.2	293° 55'.0	37'.1	338° 06'.0	54'.2	229° 15'.1	29'.6
05	104° 48'.6	211° 58'.1	46'.7	308° 56'.0	36'.6	353° 08'.3	54'.2	244° 17'.3	29'.7
06	119° 51'.0	226° 57'.6	47'.1	323° 57'.1	36'.1	8° 10'.6	54'.2	259° 19'.4	29'.8
07	134° 53'.5	241° 57'.2	47'.5	338° 58'.1	35'.6	23° 13'.0	54'.1	274° 21'.6	29'.9
08	149° 56'.0	256° 56'.8	47'.9	353° 59'.2	35'.0	38° 15'.3	54'.1	289° 23'.8	30'.0
09	164° 58'.4	271° 56'.4	48'.3	9° 00'.2	34'.5	53° 17'.6	54'.1	304° 26'.0	30'.1
10	180° 00'.9	286° 55'.9	48'.8	24° 01'.3	34'.0	68° 19'.9	54'.1	319° 28'.1	30'.2
11	195° 03'.4	301° 55'.5	49'.2	39° 02'.3	33'.5	83° 22'.2	54'.1	334° 30'.3	30'.3
12	210° 05'.8	316° 55'.1	25° 49'.6 S	54° 03'.4	11° 33'.0 N	98° 24'.5	21° 54'.1 N	349° 32'.5	13° 30'.4 S
13	225° 08'.3	331° 54'.6	50'.0	69° 04'.5	32'.5	113° 26'.9	54'.0	4° 34'.7	30'.5
14	240° 10'.8	346° 54'.2	50'.4	84° 05'.5	31'.9	128° 29'.2	54'.0	19° 36'.9	30'.5
15	255° 13'.2	1° 53'.8	50'.8	99° 06'.6	31'.4	143° 31'.5	54'.0	34° 39'.0	30'.6
16	270° 15'.7	16° 53'.3	51'.2	114° 07'.6	30'.9	158° 33'.8	54'.0	49° 41'.2	30'.7
17	285° 18'.1	31° 52'.9	51'.6	129° 08'.7	30'.4	173° 36'.1	54'.0	64° 43'.4	30'.8
18	300° 20'.6	46° 52'.5	52'.0	144° 09'.7	29'.9	188° 38'.5	54'.0	79° 45'.6	30'.9
19	315° 23'.1	61° 52'.1	52'.5	159° 10'.8	29'.4	203° 40'.8	54'.0	94° 47'.7	31'.0
20	330° 25'.5	76° 51'.6	52'.9	174° 11'.8	28'.9	218° 43'.1	53'.9	109° 49'.9	31'.1
21	345° 28'.0	91° 51'.2	53'.3	189° 12'.9	28'.3	233° 45'.4	53'.9	124° 52'.1	31'.2
22	0° 30'.5	106° 50'.8	53'.7	204° 13'.9	27'.8	248° 47'.8	53'.9	139° 54'.3	31'.3
23	15° 32'.9	121° 50'.4	54'.1	219° 15'.0	27'.3	263° 50'.1	53'.9	154° 56'.4	31'.4
	M.P. 22:02	v -0'.4	d 0'.4	v 1'.0	d 0'.5	v 2'.3	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 14'.9 S
Achernar	335° 26'.1	57° 10'.0 S
Acrux	173° 09'.6	63° 10'.4 S
Adhara	255° 12'.2	28° 59'.4 S
Aldebaran	290° 48'.9	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.1 N
Alkaid	152° 59'.2	49° 14'.7 N
Alnair	27° 43'.2	46° 53'.6 S
Alnilam	275° 46'.0	1° 11'.6 S
Alphard	217° 56'.0	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.4 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 08'.0	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.2	69° 03'.1 S
Avior	234° 17'.9	59° 33'.0 S
Bellatrix	278° 31'.6	6° 21'.7 N
Betelgeuse	271° 00'.9	7° 24'.5 N
Canopus	263° 55'.8	52° 42'.0 S
Capella	280° 33'.8	46° 00'.4 N
Deneb	49° 31'.2	45° 20'.2 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.0	61° 40'.4 N
Elnath	278° 12'.1	28° 37'.0 N
Eltanin	90° 46'.3	51° 29'.7 N
Enif	33° 46'.7	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.8 S
Gacrux	172° 01'.1	57° 11'.3 S
Gienah	175° 52'.4	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.3 S
Hamal	328° 00'.1	23° 31'.7 N
Kaus Aust.	83° 43'.7	34° 22'.6 S
Kochab	137° 21'.3	74° 06'.1 N
Markab	13° 37'.9	15° 17'.0 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.1 S
Miaplacidus	221° 39'.8	69° 46'.2 S
Mirfak	308° 39'.5	49° 54'.5 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 18'.8	56° 41'.5 S
Polaris	317° 13'.2	89° 19'.3 N
Pollux	243° 27'.4	27° 59'.3 N
Procyon	244° 59'.5	5° 11'.3 N
Rasalhague	96° 06'.4	12° 33'.3 N
Regulus	207° 43'.5	11° 53'.9 N
Rigel	281° 11'.6	8° 11'.1 S
Rigil Kent	139° 52'.0	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.6	56° 37'.0 N
Shaula	96° 21'.8	37° 06'.7 S
Sirius	258° 33'.4	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.4	43° 29'.2 S
Vega	80° 38'.9	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	108° 33'.5	14:52
Mars	204° 48'.6	08:26
Jupiter	248° 24'.2	05:31
Saturn	139° 37'.0	12:45

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 44'.7	9° 57'.4 S	3° 57'.9	11'.3	11° 01'.7 N	9'.1	56'.8
198° 44'.8	58'.3	18° 28'.2	11'.4	10'.8	9'.1	
213° 44'.9	59'.2	32° 58'.6	11'.3	19'.9	9'.0	
228° 45'.0	10° 00'.1 S	47° 28'.9	11'.3	28'.9	8'.9	
243° 45'.1	01'.0	61° 59'.2	11'.3	37'.8	8'.9	56'.7
258° 45'.3	01'.9	76° 29'.5	11'.3	46'.7	8'.8	
273° 45'.4	02'.8	90° 59'.8	11'.3	55'.5	8'.7	
288° 45'.5	03'.7	105° 30'.1	11'.3	12° 04'.2 N	8'.7	
303° 45'.6	04'.6	120° 00'.4	11'.3	12'.9	8'.6	
318° 45'.7	05'.5	134° 30'.7	11'.3	21'.5	8'.5	56'.6
333° 45'.8	06'.4	149° 01'.0	11'.2	30'.0	8'.4	
348° 45'.9	07'.3	163° 31'.2	11'.3	38'.4	8'.4	
3° 46'.1	10° 08'.2 S	178° 01'.5	11'.2	12° 46'.8 N	8'.3	56'.6
18° 46'.2	09'.1	192° 31'.7	11'.3	55'.1	8'.3	56'.5
33° 46'.3	10'.0	207° 02'.0	11'.2	13° 03'.4 N	8'.1	
48° 46'.4	10'.9	221° 32'.2	11'.3	11'.5	8'.1	
63° 46'.5	11'.8	236° 02'.5	11'.2	19'.6	8'.0	
78° 46'.6	12'.7	250° 32'.7	11'.2	27'.6	7'.9	56'.4
93° 46'.7	13'.6	265° 02'.9	11'.2	35'.5	7'.9	
108° 46'.8	14'.5	279° 33'.1	11'.2	43'.4	7'.8	
123° 47'.0	15'.4	294° 03'.3	11'.2	51'.2	7'.7	
138° 47'.1	16'.3	308° 33'.5	11'.2	58'.9	7'.6	56'.3
153° 47'.2	17'.2	323° 03'.7	11'.2	14° 06'.5 N	7'.6	
168° 47'.3	18'.1	337° 33'.9	11'.1	14'.1	7'.4	
183° 47'.4	10° 19'.0 S	352° 04'.0	11'.2	14° 21'.5 N	7'.4	56'.3
198° 47'.5	19'.9	6° 34'.2	11'.2	28'.9	7'.3	56'.2
213° 47'.6	20'.8	21° 04'.4	11'.1	36'.2	7'.2	
228° 47'.7	21'.7	35° 34'.5	11'.2	43'.4	7'.2	
243° 47'.8	22'.6	50° 04'.7	11'.1	50'.6	7'.1	
258° 47'.9	23'.5	64° 34'.8	11'.1	57'.7	6'.9	56'.1
273° 48'.1	24'.4	79° 04'.9	11'.2	15° 04'.6 N	6'.9	
288° 48'.2	25'.3	93° 35'.1	11'.1	11'.5	6'.9	
303° 48'.3	26'.2	108° 05'.2	11'.1	18'.4	6'.7	
318° 48'.4	27'.0	122° 35'.3	11'.1	25'.1	6'.6	56'.0
333° 48'.5	27'.9	137° 05'.4	11'.1	31'.7	6'.6	
348° 48'.6	28'.8	151° 35'.5	11'.1	38'.3	6'.5	
3° 48'.7	10° 29'.7 S	166° 05'.6	11'.1	15° 44'.8 N	6'.4	56'.0
18° 48'.8	30'.6	180° 35'.7	11'.1	51'.2	6'.3	
33° 48'.9	31'.5	195° 05'.8	11'.1	57'.5	6'.2	55'.9
48° 49'.0	32'.4	209° 35'.9	11'.0	16° 03'.7 N	6'.1	
63° 49'.1	33'.3	224° 05'.9	11'.1	09'.8	6'.1	
78° 49'.2	34'.2	238° 36'.0	11'.1	15'.9	5'.9	
93° 49'.3	35'.1	253° 06'.1	11'.0	21'.8	5'.9	55'.8
108° 49'.4	36'.0	267° 36'.1	11'.1	27'.7	5'.8	
123° 49'.5	36'.9	282° 06'.2	11'.1	33'.5	5'.7	
138° 49'.6	37'.8	296° 36'.3	11'.0	39'.2	5'.6	
153° 49'.7	38'.6	311° 06'.3	11'.1	44'.8	5'.5	55'.7
168° 49'.8	39'.5	325° 36'.4	11'.0	50'.3	5'.4	
183° 50'.0	10° 40'.4 S	340° 06'.4	11'.1	16° 55'.7 N	5'.4	55'.7
198° 50'.1	41'.3	354° 36'.5	11'.0	17° 01'.1 N	5'.2	
213° 50'.2	42'.2	9° 06'.5	11'.1	06'.3	5'.2	55'.6
228° 50'.3	43'.1	23° 36'.6	11'.0	11'.5	5'.1	
243° 50'.4	44'.0	38° 06'.6	11'.1	16'.6	4'.9	
258° 50'.5	44'.9	52° 36'.7	11'.0	21'.5	4'.9	
273° 50'.6	45'.8	67° 06'.7	11'.1	26'.4	4'.8	
288° 50'.7	46'.7	81° 36'.8	11'.0	31'.2	4'.7	55'.5
303° 50'.8	47'.5	96° 06'.8	11'.0	35'.9	4'.6	
318° 50'.9	48'.4	110° 36'.8	11'.1	40'.5	4'.5	
333° 51'.0	49'.3	125° 06'.9	11'.0	45'.0	4'.4	
348° 51'.1	50'.2	139° 36'.9	11'.1	49'.4	4'.4	55'.4
3° 51'.2	10° 51'.1 S	154° 07'.0	11'.0	17° 53'.8 N	4'.2	55'.4
18° 51'.3	52'.0	168° 37'.0	11'.1	58'.0	4'.2	
33° 51'.4	52'.9	183° 07'.1	11'.0	18° 02'.2 N	4'.0	
48° 51'.5	53'.7	197° 37'.1	11'.1	06'.2	4'.0	
63° 51'.6	54'.6	212° 07'.2	11'.1	10'.2	3'.8	55'.3
78° 51'.7	55'.5	226° 37'.3	11'.0	14'.0	3'.8	
93° 51'.8	56'.4	241° 07'.3	11'.1	17'.8	3'.7	
108° 51'.9	57'.3	255° 37'.4	11'.1	21'.5	3'.5	
123° 52'.0	58'.2	270° 07'.5	11'.0	25'.0	3'.5	
138° 52'.0	59'.1	284° 37'.5	11'.1	28'.5	3'.4	55'.2
153° 52'.1	59'.9	299° 07'.6	11'.1	31'.9	3'.3	
168° 52'.2	11° 00'.8 S	313° 37'.7	11'.1	35'.2	3'.2	
SD 16'.1	d 0'.9	SD	15'.4	15'.3	15'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 19	Moonrise 20	Moonrise 21
N 72°	05:17	06:36	07:50	15:11	14:55	14:07
N 70°	05:19	06:30	07:35	15:35	15:35	15:37
68°	05:19	06:24	07:23	15:54	16:02	16:16
66°	05:20	06:20	07:13	16:09	16:23	16:44
64°	05:20	06:16	07:05	16:21	16:40	17:05
62°	05:21	06:12	06:58	16:32	16:54	17:22
60°	05:21	06:09	06:52	16:41	17:05	17:36
N 58°	05:21	06:06	06:47	16:49	17:16	17:48
56°	05:20	06:04	06:42	16:56	17:25	17:59
54°	05:20	06:01	06:37	17:02	17:32	18:08
52°	05:20	05:59	06:34	17:07	17:40	18:17
50°	05:19	05:57	06:30	17:13	17:46	18:24
45°	05:18	05:52	06:22	17:24	18:00	18:40
N 40°	05:17	05:48	06:16	17:33	18:11	18:53
35°	05:15	05:45	06:10	17:41	18:21	19:04
30°	05:13	05:41	06:05	17:48	18:30	19:14
20°	05:08	05:34	05:57	18:00	18:45	19:31
N 10°	05:03	05:27	05:49	18:11	18:58	19:46
0°	04:56	05:20	05:41	18:21	19:10	20:00
S 10°	04:48	05:13	05:34	18:31	19:23	20:14
20°	04:37	05:03	05:26	18:42	19:36	20:29
30°	04:23	04:52	05:17	18:55	19:51	20:46
35°	04:14	04:45	05:11	19:02	20:00	20:56
40°	04:03	04:37	05:05	19:10	20:10	21:07
45°	03:50	04:27	04:58	19:20	20:22	21:21
S 50°	03:32	04:15	04:49	19:32	20:37	21:38
52°	03:24	04:09	04:45	19:37	20:44	21:45
54°	03:14	04:02	04:40	19:43	20:51	21:54
56°	03:03	03:55	04:35	19:50	21:00	22:04
58°	02:50	03:47	04:30	19:58	21:09	22:15
S 60°	02:34	03:37	04:24	20:06	21:20	22:28
S 62°	02:15	03:26	04:16	20:16	21:33	22:43

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 19	Moonset 20	Moonset 21
N 72°	15:38	16:52	18:10	08:49	10:48	13:19
N 70°	15:53	16:58	18:09	08:26	10:09	11:50
68°	16:05	17:04	18:08	08:09	09:43	11:11
66°	16:15	17:08	18:08	07:55	09:23	10:44
64°	16:23	17:12	18:08	07:43	09:06	10:23
62°	16:30	17:16	18:07	07:34	08:53	10:07
60°	16:36	17:19	18:08	07:25	08:42	09:53
N 58°	16:42	17:22	18:08	07:18	08:32	09:41
56°	16:47	17:25	18:08	07:12	08:24	09:31
54°	16:51	17:27	18:08	07:06	08:16	09:22
52°	16:55	17:30	18:09	07:01	08:09	09:14
50°	16:59	17:32	18:09	06:56	08:03	09:06
45°	17:07	17:36	18:10	06:46	07:50	08:51
N 40°	17:13	17:41	18:12	06:38	07:39	08:38
35°	17:19	17:44	18:14	06:31	07:30	08:27
30°	17:24	17:48	18:16	06:24	07:22	08:18
20°	17:33	17:55	18:21	06:14	07:08	08:02
N 10°	17:41	18:02	18:27	06:04	06:56	07:47
0°	17:48	18:09	18:34	05:55	06:45	07:34
S 10°	17:56	18:17	18:42	05:47	06:33	07:21
20°	18:04	18:26	18:53	05:37	06:21	07:07
30°	18:13	18:38	19:07	05:27	06:08	06:51
35°	18:19	18:45	19:16	05:20	06:00	06:41
40°	18:25	18:54	19:27	05:13	05:51	06:31
45°	18:33	19:04	19:41	05:05	05:40	06:18
S 50°	18:42	19:16	19:59	04:56	05:27	06:03
52°	18:46	19:22	20:07	04:51	05:21	05:56
54°	18:50	19:29	20:17	04:46	05:15	05:48
56°	18:55	19:36	20:29	04:41	05:08	05:39
58°	19:01	19:45	20:42	04:35	04:59	05:29
S 60°	19:08	19:55	20:58	04:28	04:50	05:18
S 62°	19:15	20:06	21:19	04:20	04:40	05:04

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
19	14 59	15 04	11:45	24:33	12:08	14d Full
20	15 09	15 15	11:45	00:33	12:58	15d 98%
21	15 20	15 24	11:45	01:22	13:47	16d 94%

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2013 October 22, 23, 24 (Tue, Wed, Thur)

GMT	ARIES	VENUS -4.3		MARS +1.5		JUPITER -2.3		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
22 Tuesday 00	30° 35'.4	136° 49'.9	25° 54'.5 S	234° 16'.0	11° 26'.8 N	278° 52'.4	21° 53'.9 N	169° 58'.6	13° 31'.5 S
01	45° 37'.9	151° 49'.5	54'.9	249° 17'.1	26'.3	293° 54'.7	53'.9	185° 00'.8	31'.6
02	60° 40'.3	166° 49'.1	55'.3	264° 18'.1	25'.8	308° 57'.0	53'.9	200° 03'.0	31'.6
03	75° 42'.8	181° 48'.6	55'.7	279° 19'.2	25'.2	323° 59'.4	53'.8	215° 05'.1	31'.7
04	90° 45'.2	196° 48'.2	56'.1	294° 20'.2	24'.7	339° 01'.7	53'.8	230° 07'.3	31'.8
05	105° 47'.7	211° 47'.8	56'.5	309° 21'.3	24'.2	354° 04'.0	53'.8	245° 09'.5	31'.9
06	120° 50'.2	226° 47'.4	56'.9	324° 22'.4	23'.7	9° 06'.3	53'.8	260° 11'.7	32'.0
07	135° 52'.6	241° 46'.9	57'.2	339° 23'.4	23'.2	24° 08'.7	53'.8	275° 13'.9	32'.1
08	150° 55'.1	256° 46'.5	57'.6	354° 24'.5	22'.7	39° 11'.0	53'.8	290° 16'.0	32'.2
09	165° 57'.6	271° 46'.1	58'.0	9° 25'.5	22'.1	54° 13'.3	53'.8	305° 18'.2	32'.3
10	181° 00'.0	286° 45'.7	58'.4	24° 26'.6	21'.6	69° 15'.7	53'.7	320° 20'.4	32'.4
11	196° 02'.5	301° 45'.2	58'.8	39° 27'.6	21'.1	84° 18'.0	53'.7	335° 22'.6	32'.5
12	211° 05'.0	316° 44'.8	25° 59'.2 S	54° 28'.7	11° 20'.6 N	99° 20'.3	21° 53'.7 N	350° 24'.7	13° 32'.6 S
13	226° 07'.4	331° 44'.4	59'.6	69° 29'.7	20'.1	114° 22'.6	53'.7	5° 26'.9	32'.7
14	241° 09'.9	346° 44'.0	26° 00'.0 S	84° 30'.8	19'.6	129° 25'.0	53'.7	20° 29'.1	32'.7
15	256° 12'.4	1° 43'.5	00'.4	99° 31'.8	19'.0	144° 27'.3	53'.7	35° 31'.3	32'.8
16	271° 14'.8	16° 43'.1	00'.7	114° 32'.9	18'.5	159° 29'.6	53'.7	50° 33'.4	32'.9
17	286° 17'.3	31° 42'.7	01'.1	129° 34'.0	18'.0	174° 31'.9	53'.6	65° 35'.6	33'.0
18	301° 19'.7	46° 42'.3	01'.5	144° 35'.0	17'.5	189° 34'.3	53'.6	80° 37'.8	33'.1
19	316° 22'.2	61° 41'.9	01'.9	159° 36'.1	17'.0	204° 36'.6	53'.6	95° 40'.0	33'.2
20	331° 24'.7	76° 41'.4	02'.3	174° 37'.1	16'.4	219° 38'.9	53'.6	110° 42'.1	33'.3
21	346° 27'.1	91° 41'.0	02'.7	189° 38'.2	15'.9	234° 41'.3	53'.6	125° 44'.3	33'.4
22	1° 29'.6	106° 40'.6	03'.0	204° 39'.2	15'.4	249° 43'.6	53'.6	140° 46'.5	33'.5
23	16° 32'.1	121° 40'.2	03'.4	219° 40'.3	14'.9	264° 45'.9	53'.6	155° 48'.7	33'.6
23 Wednesday 00	31° 34'.5	136° 39'.7	26° 03'.8 S	234° 41'.4	11° 14'.4 N	279° 48'.3	21° 53'.5 N	170° 50'.8	13° 33'.7 S
01	46° 37'.0	151° 39'.3	04'.2	249° 42'.4	13'.9	294° 50'.6	53'.5	185° 53'.0	33'.8
02	61° 39'.5	166° 38'.9	04'.5	264° 43'.5	13'.3	309° 52'.9	53'.5	200° 55'.2	33'.8
03	76° 41'.9	181° 38'.5	04'.9	279° 44'.5	12'.8	324° 55'.3	53'.5	215° 57'.4	33'.9
04	91° 44'.4	196° 38'.1	05'.3	294° 45'.6	12'.3	339° 57'.6	53'.5	230° 59'.5	34'.0
05	106° 46'.9	211° 37'.6	05'.7	309° 46'.7	11'.8	354° 59'.9	53'.5	246° 01'.7	34'.1
06	121° 49'.3	226° 37'.2	06'.0	324° 47'.7	11'.3	10° 02'.3	53'.5	261° 03'.9	34'.2
07	136° 51'.8	241° 36'.8	06'.4	339° 48'.8	10'.8	25° 04'.6	53'.5	276° 06'.1	34'.3
08	151° 54'.2	256° 36'.4	06'.8	354° 49'.8	10'.2	40° 06'.9	53'.4	291° 08'.3	34'.4
09	166° 56'.7	271° 35'.9	07'.1	9° 50'.9	09'.7	55° 09'.3	53'.4	306° 10'.4	34'.5
10	181° 59'.2	286° 35'.5	07'.5	24° 52'.0	09'.2	70° 11'.6	53'.4	321° 12'.6	34'.6
11	197° 01'.6	301° 35'.1	07'.9	39° 53'.0	08'.7	85° 13'.9	53'.4	336° 14'.8	34'.7
12	212° 04'.1	316° 34'.7	26° 08'.2 S	54° 54'.1	11° 08'.2 N	100° 16'.3	21° 53'.4 N	351° 17'.0	13° 34'.8 S
13	227° 06'.6	331° 34'.3	08'.6	69° 55'.1	07'.6	115° 18'.6	53'.4	6° 19'.1	34'.9
14	242° 09'.0	346° 33'.9	08'.9	84° 56'.2	07'.1	130° 20'.9	53'.4	21° 21'.3	34'.9
15	257° 11'.5	1° 33'.4	09'.3	99° 57'.3	06'.6	145° 23'.3	53'.3	36° 23'.5	35'.0
16	272° 14'.0	16° 33'.0	09'.7	114° 58'.3	06'.1	160° 25'.6	53'.3	51° 25'.7	35'.1
17	287° 16'.4	31° 32'.6	10'.0	129° 59'.4	05'.6	175° 27'.9	53'.3	66° 27'.8	35'.2
18	302° 18'.9	46° 32'.2	10'.4	145° 00'.4	05'.1	190° 30'.3	53'.3	81° 30'.0	35'.3
19	317° 21'.4	61° 31'.8	10'.7	160° 01'.5	04'.5	205° 32'.6	53'.3	96° 32'.2	35'.4
20	332° 23'.8	76° 31'.3	11'.1	175° 02'.6	04'.0	220° 35'.0	53'.3	111° 34'.4	35'.5
21	347° 26'.3	91° 30'.9	11'.4	190° 03'.6	03'.5	235° 37'.3	53'.3	126° 36'.5	35'.6
22	2° 28'.7	106° 30'.5	11'.8	205° 04'.7	03'.0	250° 39'.6	53'.3	141° 38'.7	35'.7
23	17° 31'.2	121° 30'.1	12'.1	220° 05'.7	02'.5	265° 42'.0	53'.2	156° 40'.9	35'.8
24 Thursday 00	32° 33'.7	136° 29'.7	26° 12'.5 S	235° 06'.8	11° 01'.9 N	280° 44'.3	21° 53'.2 N	171° 43'.1	13° 35'.9 S
01	47° 36'.1	151° 29'.3	12'.8	250° 07'.9	01'.4	295° 46'.7	53'.2	186° 45'.2	35'.9
02	62° 38'.6	166° 28'.8	13'.2	265° 08'.9	00'.9	310° 49'.0	53'.2	201° 47'.4	36'.0
03	77° 41'.1	181° 28'.4	13'.5	280° 10'.0	00'.4	325° 51'.3	53'.2	216° 49'.6	36'.1
04	92° 43'.5	196° 28'.0	13'.9	295° 11'.1	10° 59'.9 N	340° 53'.7	53'.2	231° 51'.8	36'.2
05	107° 46'.0	211° 27'.6	14'.2	310° 12'.1	59'.3	355° 56'.0	53'.2	246° 53'.9	36'.3
06	122° 48'.5	226° 27'.2	14'.6	325° 13'.2	58'.8	10° 58'.4	53'.2	261° 56'.1	36'.4
07	137° 50'.9	241° 26'.8	14'.9	340° 14'.3	58'.3	26° 00'.7	53'.1	276° 58'.3	36'.5
08	152° 53'.4	256° 26'.3	15'.3	355° 15'.3	57'.8	41° 03'.0	53'.1	292° 00'.5	36'.6
09	167° 55'.8	271° 25'.9	15'.6	10° 16'.4	57'.3	56° 05'.4	53'.1	307° 02'.6	36'.7
10	182° 58'.3	286° 25'.5	15'.9	25° 17'.4	56'.7	71° 07'.7	53'.1	322° 04'.8	36'.8
11	198° 00'.8	301° 25'.1	16'.3	40° 18'.5	56'.2	86° 10'.1	53'.1	337° 07'.0	36'.9
12	213° 03'.2	316° 24'.7	26° 16'.6 S	55° 19'.6	10° 55'.7 N	101° 12'.4	21° 53'.1 N	352° 09'.2	13° 37'.0 S
13	228° 05'.7	331° 24'.3	16'.9	70° 20'.6	55'.2	116° 14'.8	53'.1	7° 11'.3	37'.0
14	243° 08'.2	346° 23'.9	17'.3	85° 21'.7	54'.7	131° 17'.1	53'.1	22° 13'.5	37'.1
15	258° 10'.6	1° 23'.5	17'.6	100° 22'.8	54'.2	146° 19'.5	53'.1	37° 15'.7	37'.2
16	273° 13'.1	16° 23'.0	17'.9	115° 23'.8	53'.6	161° 21'.8	53'.0	52° 17'.8	37'.3
17	288° 15'.6	31° 22'.6	18'.3	130° 24'.9	53'.1	176° 24'.1	53'.0	67° 20'.0	37'.4
18	303° 18'.0	46° 22'.2	18'.6	145° 26'.0	52'.6	191° 26'.5	53'.0	82° 22'.2	37'.5
19	318° 20'.5	61° 21'.8	18'.9	160° 27'.0	52'.1	206° 28'.8	53'.0	97° 24'.4	37'.6
20	333° 23'.0	76° 21'.4	19'.3	175° 28'.1	51'.6	221° 31'.2	53'.0	112° 26'.5	37'.7
21	348° 25'.4	91° 21'.0	19'.6	190° 29'.2	51'.0	236° 33'.5	53'.0	127° 28'.7	37'.8
22	3° 27'.9	106° 20'.6	19'.9	205° 30'.2	50'.5	251° 35'.9	53'.0	142° 30'.9	37'.9
23	18° 30'.3	121° 20'.2	20'.3	220° 31'.3	50'.0	266° 38'.2	53'.0	157° 33'.1	38'.0
	M.P. 21:50	v -0'.4	d 0'.4	v 1'.1	d 0'.5	v 2'.3	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 14'.9 S
Achernar	335° 26'.1	57° 10'.0 S
Acrux	173° 09'.6	63° 10'.4 S
Adhara	255° 12'.2	28° 59'.4 S
Aldebaran	290° 48'.8	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.7 N
Alnair	27° 43'.2	46° 53'.6 S
Alnilam	275° 45'.9	1° 11'.6 S
Alphard	217° 56'.0	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.3 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 08'.0	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.2	69° 03'.1 S
Avior	234° 17'.9	59° 33'.0 S
Bellatrix	278° 31'.5	6° 21'.7 N
Betelgeuse	271° 00'.9	7° 24'.5 N
Canopus	263° 55'.8	52° 42'.0 S
Capella	280° 33'.8	46° 00'.4 N
Deneb	49° 31'.2	45° 20'.3 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.5 S
Dubhe	193° 52'.0	61° 40'.3 N
Elnath	278° 12'.1	28° 37'.0 N
Eltanin	90° 46'.3	51° 29'.7 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.9 S
Gacrux	172° 01'.1	57° 11'.3 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.3 S
Hamal	328° 00'.1	23° 31'.7 N
Kaus Aust.	83° 43'.7	34° 22'.6 S
Kochab	137° 21'.3	74° 06'.1 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.1 S
Miaplacidus	221° 39'.8	69° 46'.2 S
Mirfak	308° 39'.5	49° 54'.5 N
Nunki	75° 58'.1	26° 16'.6 S
Peacock	53° 18'.9	56° 41'.5 S
Polaris	317° 12'.5	89° 19'.3 N
Pollux	243° 27'.4	27° 59'.3 N
Procyon	244° 59'.4	5° 11'.3 N
Rasalhague	96° 06'.4	12° 33'.3 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 11'.6	8° 11'.2 S
Rigil Kent	139° 52'.0	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.6	56° 37'.0 N
Shaula	96° 21'.8	37° 06'.7 S
Sirius	258° 33'.4	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.3	43° 29'.2 S
Vega	80° 39'.0	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	105° 05'.2	14:54
Mars	203° 06'.8	08:21
Jupiter	248° 13'.7	05:20
Saturn	139° 16'.3	12:35

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP
183° 52'.3	11° 01'.7 S	328° 07'.8	11'.1	18° 38'.4 N	3'.1	55'.2
198° 52'.4	02'.6	342° 37'.9	11'.1	41'.5	3'.0	
213° 52'.5	03'.5	357° 08'.0	11'.1	44'.5	2'.9	55'.1
228° 52'.6	04'.4	11° 38'.1	11'.1	47'.4	2'.9	
243° 52'.7	05'.2	26° 08'.2	11'.2	50'.3	2'.7	
258° 52'.8	06'.1	40° 38'.4	11'.1	53'.0	2'.6	
273° 52'.9	07'.0	55° 08'.5	11'.2	55'.6	2'.5	
288° 53'.0	07'.9	69° 38'.7	11'.1	58'.1	2'.5	55'.0
303° 53'.1	08'.8	84° 08'.8	11'.2	19° 00'.6 N	2'.3	
318° 53'.2	09'.6	98° 39'.0	11'.2	02'.9	2'.3	
333° 53'.3	10'.5	113° 09'.2	11'.1	05'.2	2'.1	
348° 53'.4	11'.4	127° 39'.3	11'.2	07'.3	2'.1	
3° 53'.5	11° 12'.3 S	142° 09'.5	11'.3	19° 09'.4 N	1'.9	54'.9
18° 53'.6	13'.2	156° 39'.8	11'.2	11'.3	1'.9	
33° 53'.7	14'.0	171° 10'.0	11'.2	13'.2	1'.8	
48° 53'.7	14'.9	185° 40'.2	11'.3	15'.0	1'.6	
63° 53'.8	15'.8	200° 10'.5	11'.2	16'.6	1'.6	
78° 53'.9	16'.7	214° 40'.7	11'.3	18'.2	1'.5	
93° 54'.0	17'.6	229° 11'.0	11'.3	19'.7	1'.4	54'.8
108° 54'.1	18'.4	243° 41'.3	11'.3	21'.1	1'.3	
123° 54'.2	19'.3	258° 11'.6	11'.3	22'.4	1'.2	
138° 54'.3	20'.2	272° 41'.9	11'.3	23'.6	1'.1	
153° 54'.4	21'.1	287° 12'.2	11'.4	24'.7	1'.0	
168° 54'.5	22'.0	301° 42'.6	11'.3	25'.7	0'.9	54'.7
183° 54'.6	11° 22'.8 S	316° 12'.9	11'.4	19° 26'.6 N	0'.8	54'.7
198° 54'.6	23'.7	330° 43'.3	11'.4	27'.4	0'.8	
213° 54'.7	24'.6	345° 13'.7	11'.4	28'.2	0'.6	
228° 54'.8	25'.5	359° 44'.1	11'.4	28'.8	0'.5	
243° 54'.9	26'.3	14° 14'.5	11'.5	29'.3	0'.5	
258° 55'.0	27'.2	28° 45'.0	11'.4	29'.8	0'.3	
273° 55'.1	28'.1	43° 15'.4	11'.5	30'.1	0'.3	54'.6
288° 55'.2	29'.0	57° 45'.9	11'.5	30'.4	0'.1	
303° 55'.3	29'.8	72° 16'.4	11'.5	30'.5	0'.1	
318° 55'.3	30'.7	86° 46'.9	11'.6	30'.6	0'.0	
333° 55'.4	31'.6	101° 17'.5	11'.5	30'.6	0'.1	
348° 55'.5	32'.5	115° 48'.0	11'.6	30'.5	0'.2	
3° 55'.6	11° 33'.3 S	130° 18'.6	11'.6	19° 30'.3 N	0'.4	54'.6
18° 55'.7	34'.2	144° 49'.2	11'.6	29'.9	0'.4	54'.5
33° 55'.8	35'.1	159° 19'.8	11'.6	29'.5	0'.4	
48° 55'.8	35'.9	173° 50'.4	11'.7	29'.1	0'.6	
63° 55'.9	36'.8	188° 21'.1	11'.7	28'.5	0'.7	
78° 56'.0	37'.7	202° 51'.8	11'.7	27'.8	0'.8	
93° 56'.1	38'.6	217° 22'.5	11'.7	27'.0	0'.8	
108° 56'.2	39'.4	231° 53'.2	11'.7	26'.2	1'.0	
123° 56'.3	40'.3	246° 23'.9	11'.8	25'.2	1'.0	
138° 56'.3	41'.2	260° 54'.7	11'.8	24'.2	1'.2	54'.4
153° 56'.4	42'.0	275° 25'.5	11'.8	23'.0	1'.2	
168° 56'.5	42'.9	289° 56'.3	11'.9	21'.8	1'.3	
183° 56'.6	11° 43'.8 S	304° 27'.2	11'.8	19° 20'.5 N	1'.4	54'.4
198° 56'.7	44'.6	318° 58'.0	11'.9	19'.1	1'.5	
213° 56'.8	45'.5	333° 28'.9	11'.9	17'.6	1'.6	
228° 56'.8	46'.4	347° 59'.8	11'.9	16'.0	1'.7	
243° 56'.9	47'.3	2° 30'.7	12'.0	14'.3	1'.7	
258° 57'.0	48'.1	17° 01'.7	12'.0	12'.6	1'.9	
273° 57'.1	49'.0	31° 32'.7	12'.0	10'.7	1'.9	
288° 57'.2	49'.9	46° 03'.7	12'.0	08'.8	2'.0	54'.3
303° 57'.2	50'.7	60° 34'.7	12'.1	06'.8	2'.1	
318° 57'.3	51'.6	75° 05'.8	12'.1	04'.7	2'.3	
333° 57'.4	52'.5	89° 36'.9	12'.1	02'.4	2'.2	
348° 57'.5	53'.3	104° 08'.0	12'.1	00'.2	2'.4	
3° 57'.5	11° 54'.2 S	118° 39'.1	12'.2	18° 57'.8 N	2'.5	54'.3
18° 57'.6	55'.1	133° 10'.3	12'.2	55'.3	2'.5	
33° 57'.7	55'.9	147° 41'.5	12'.2	52'.8	2'.7	
48° 57'.8	56'.8	162° 12'.7	12'.2	50'.1	2'.7	
63° 57'.9	57'.6	176° 43'.9	12'.3	47'.4	2'.8	
78° 57'.9	58'.5	191° 15'.2	12'.3	44'.6	2'.9	
93° 58'.0	59'.4	205° 46'.5	12'.3	41'.7	3'.0	
108° 58'.1	12° 00'.2 S	220° 17'.8	12'.4	38'.7	3'.1	
123° 58'.2	01'.1	234° 49'.2	12'.4	35'.6	3'.1	
138° 58'.2	02'.0	249° 20'.6	12'.4	32'.5	3'.2	54'.2
153° 58'.3	02'.8	263° 52'.0	12'.4	29'.3	3'.4	
168° 58'.4	03'.7	278° 23'.4	12'.5	25'.9	3'.4	
SD 16'.1	d 0'.9	SD	15'.0	14'.9	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 22	Moonrise 23	Moonrise 24
N 72°	05:30	06:49	08:06	-	-	-
N 70°	05:30	06:41	07:48	15:48	16:27	17:46
68°	05:30	06:35	07:35	16:43	17:28	18:33
66°	05:29	06:29	07:24	17:16	18:02	19:03
64°	05:29	06:24	07:14	17:40	18:27	19:26
62°	05:28	06:20	07:06	17:59	18:47	19:44
60°	05:28	06:16	06:59	18:15	19:03	19:59
N 58°	05:27	06:13	06:53	18:28	19:16	20:12
56°	05:26	06:10	06:48	18:40	19:28	20:23
54°	05:26	06:07	06:43	18:50	19:38	20:32
52°	05:25	06:04	06:39	18:59	19:47	20:41
50°	05:24	06:02	06:35	19:07	19:56	20:49
45°	05:22	05:56	06:26	19:24	20:13	21:05
N 40°	05:20	05:51	06:19	19:38	20:27	21:18
35°	05:17	05:47	06:13	19:50	20:39	21:30
30°	05:15	05:43	06:07	20:01	20:50	21:40
20°	05:09	05:35	05:58	20:19	21:08	21:57
N 10°	05:03	05:28	05:49	20:35	21:23	22:12
0°	04:55	05:20	05:41	20:49	21:38	22:26
S 10°	04:46	05:11	05:33	21:04	21:53	22:40
20°	04:35	05:01	05:24	21:20	22:08	22:55
30°	04:19	04:49	05:13	21:38	22:26	23:12
35°	04:10	04:41	05:08	21:48	22:37	23:22
40°	03:58	04:32	05:01	22:01	22:49	23:33
45°	03:44	04:22	04:53	22:15	23:03	23:46
S 50°	03:25	04:08	04:43	22:32	23:21	24:02
52°	03:16	04:02	04:39	22:41	23:29	24:10
54°	03:05	03:55	04:34	22:50	23:38	24:18
56°	02:53	03:47	04:28	23:00	23:48	24:28
58°	02:39	03:38	04:22	23:12	24:00	24:39
S 60°	02:22	03:27	04:15	23:26	-	00:13
S 62°	01:59	03:15	04:07	23:42	-	00:29

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 22	Moonset 23	Moonset 24
N 72°	15:21	16:37	17:56	-	-	-
N 70°	15:39	16:46	17:57	13:22	14:25	14:46
68°	15:52	16:52	17:57	12:28	13:24	13:59
66°	16:04	16:58	17:58	11:55	12:50	13:28
64°	16:13	17:03	17:58	11:30	12:24	13:05
62°	16:21	17:07	17:59	11:11	12:05	12:46
60°	16:28	17:11	18:00	10:56	11:49	12:31
N 58°	16:34	17:15	18:01	10:43	11:35	12:18
56°	16:40	17:18	18:01	10:31	11:23	12:07
54°	16:44	17:21	18:02	10:21	11:13	11:57
52°	16:49	17:24	18:03	10:12	11:04	11:49
50°	16:53	17:26	18:04	10:04	10:56	11:41
45°	17:02	17:32	18:06	09:47	10:38	11:24
N 40°	17:09	17:37	18:08	09:33	10:24	11:10
35°	17:15	17:41	18:11	09:22	10:12	10:59
30°	17:21	17:45	18:13	09:11	10:02	10:49
20°	17:31	17:53	18:19	08:54	09:44	10:31
N 10°	17:39	18:01	18:26	08:38	09:28	10:16
0°	17:48	18:09	18:33	08:24	09:13	10:01
S 10°	17:56	18:18	18:43	08:09	08:58	09:47
20°	18:05	18:28	18:54	07:54	08:42	09:31
30°	18:16	18:40	19:10	07:36	08:24	09:14
35°	18:22	18:48	19:19	07:26	08:13	09:03
40°	18:29	18:57	19:31	07:14	08:01	08:51
45°	18:37	19:08	19:46	07:00	07:47	08:37
S 50°	18:47	19:22	20:05	06:43	07:29	08:20
52°	18:51	19:28	20:14	06:36	07:21	08:12
54°	18:56	19:35	20:25	06:27	07:12	08:03
56°	19:02	19:43	20:38	06:17	07:01	07:53
58°	19:08	19:53	20:52	06:05	06:50	07:41
S 60°	19:15	20:04	21:10	05:52	06:36	07:28
S 62°	19:24	20:16	21:33	05:37	06:19	07:12

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
22	15 29	15 34	11:44	02:12	14:37	17d 88%
23	15 38	15 42	11:44	03:01	15:25	18d 81%
24	15 46	15 50	11:44	03:50	16:14	19d 73%

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2013 October 25, 26, 27 (Fri, Sat, Sun)

GMT	ARIES	VENUS -4.4		MARS +1.5		JUPITER -2.3		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
25 Friday 00	33° 32'.8	136° 19'.8	26° 20'.6 S	235° 32'.4	10° 49'.5 N	281° 40'.6	21° 52'.9 N	172° 35'.2	13° 38'.1 S
01	48° 35'.3	151° 19'.3	20'.9	250° 33'.4	49'.0	296° 42'.9	52'.9	187° 37'.4	38'.1
02	63° 37'.7	166° 18'.9	21'.2	265° 34'.5	48'.4	311° 45'.3	52'.9	202° 39'.6	38'.2
03	78° 40'.2	181° 18'.5	21'.5	280° 35'.6	47'.9	326° 47'.6	52'.9	217° 41'.8	38'.3
04	93° 42'.7	196° 18'.1	21'.9	295° 36'.6	47'.4	341° 50'.0	52'.9	232° 43'.9	38'.4
05	108° 45'.1	211° 17'.7	22'.2	310° 37'.7	46'.9	356° 52'.3	52'.9	247° 46'.1	38'.5
06	123° 47'.6	226° 17'.3	22'.5	325° 38'.8	46'.4	11° 54'.7	52'.9	262° 48'.3	38'.6
07	138° 50'.1	241° 16'.9	22'.8	340° 39'.8	45'.8	26° 57'.0	52'.9	277° 50'.5	38'.7
08	153° 52'.5	256° 16'.5	23'.1	355° 40'.9	45'.3	41° 59'.4	52'.9	292° 52'.6	38'.8
09	168° 55'.0	271° 16'.1	23'.4	10° 42'.0	44'.8	57° 01'.7	52'.8	307° 54'.8	38'.9
10	183° 57'.5	286° 15'.7	23'.8	25° 43'.0	44'.3	72° 04'.1	52'.8	322° 57'.0	39'.0
11	198° 59'.9	301° 15'.3	24'.1	40° 44'.1	43'.8	87° 06'.4	52'.8	337° 59'.2	39'.1
12	214° 02'.4	316° 14'.9	26° 24'.4 S	55° 45'.2	10° 43'.2 N	102° 08'.8	21° 52'.8 N	353° 01'.3	13° 39'.1 S
13	229° 04'.8	331° 14'.5	24'.7	70° 46'.3	42'.7	117° 11'.1	52'.8	8° 03'.5	39'.2
14	244° 07'.3	346° 14'.0	25'.0	85° 47'.3	42'.2	132° 13'.5	52'.8	23° 05'.7	39'.3
15	259° 09'.8	1° 13'.6	25'.3	100° 48'.4	41'.7	147° 15'.8	52'.8	38° 07'.9	39'.4
16	274° 12'.2	16° 13'.2	25'.6	115° 49'.5	41'.1	162° 18'.2	52'.8	53° 10'.0	39'.5
17	289° 14'.7	31° 12'.8	25'.9	130° 50'.5	40'.6	177° 20'.5	52'.8	68° 12'.2	39'.6
18	304° 17'.2	46° 12'.4	26'.2	145° 51'.6	40'.1	192° 22'.9	52'.8	83° 14'.4	39'.7
19	319° 19'.6	61° 12'.0	26'.5	160° 52'.7	39'.6	207° 25'.3	52'.7	98° 16'.5	39'.8
20	334° 22'.1	76° 11'.6	26'.8	175° 53'.7	39'.1	222° 27'.6	52'.7	113° 18'.7	39'.9
21	349° 24'.6	91° 11'.2	27'.1	190° 54'.8	38'.5	237° 30'.0	52'.7	128° 20'.9	40'.0
22	4° 27'.0	106° 10'.8	27'.4	205° 55'.9	38'.0	252° 32'.3	52'.7	143° 23'.1	40'.1
23	19° 29'.5	121° 10'.4	27'.7	220° 57'.0	37'.5	267° 34'.7	52'.7	158° 25'.2	40'.2
26 Saturday 00	34° 31'.9	136° 10'.0	26° 28'.0 S	235° 58'.0	10° 37'.0 N	282° 37'.0	21° 52'.7 N	173° 27'.4	13° 40'.2 S
01	49° 34'.4	151° 09'.6	28'.3	250° 59'.1	36'.5	297° 39'.4	52'.7	188° 29'.6	40'.3
02	64° 36'.9	166° 09'.2	28'.6	266° 00'.2	35'.9	312° 41'.7	52'.7	203° 31'.8	40'.4
03	79° 39'.3	181° 08'.8	28'.9	281° 01'.2	35'.4	327° 44'.1	52'.7	218° 33'.9	40'.5
04	94° 41'.8	196° 08'.4	29'.2	296° 02'.3	34'.9	342° 46'.5	52'.7	233° 36'.1	40'.6
05	109° 44'.3	211° 08'.0	29'.5	311° 03'.4	34'.4	357° 48'.8	52'.6	248° 38'.3	40'.7
06	124° 46'.7	226° 07'.6	29'.8	326° 04'.5	33'.9	12° 51'.2	52'.6	263° 40'.5	40'.8
07	139° 49'.2	241° 07'.2	30'.1	341° 05'.5	33'.3	27° 53'.5	52'.6	278° 42'.6	40'.9
08	154° 51'.7	256° 06'.8	30'.4	356° 06'.6	32'.8	42° 55'.9	52'.6	293° 44'.8	41'.0
09	169° 54'.1	271° 06'.4	30'.7	11° 07'.7	32'.3	57° 58'.3	52'.6	308° 47'.0	41'.1
10	184° 56'.6	286° 06'.0	31'.0	26° 08'.7	31'.8	73° 00'.6	52'.6	323° 49'.2	41'.2
11	199° 59'.1	301° 05'.6	31'.3	41° 09'.8	31'.2	88° 03'.0	52'.6	338° 51'.3	41'.2
12	215° 01'.5	316° 05'.2	26° 31'.5 S	56° 10'.9	10° 30'.7 N	103° 05'.3	21° 52'.6 N	353° 53'.5	13° 41'.3 S
13	230° 04'.0	331° 04'.8	31'.8	71° 12'.0	30'.2	118° 07'.7	52'.6	8° 55'.7	41'.4
14	245° 06'.4	346° 04'.4	32'.1	86° 13'.0	29'.7	133° 10'.1	52'.6	23° 57'.8	41'.5
15	260° 08'.9	1° 04'.0	32'.4	101° 14'.1	29'.2	148° 12'.4	52'.5	39° 00'.0	41'.6
16	275° 11'.4	16° 03'.6	32'.7	116° 15'.2	28'.6	163° 14'.8	52'.5	54° 02'.2	41'.7
17	290° 13'.8	31° 03'.2	33'.0	131° 16'.3	28'.1	178° 17'.1	52'.5	69° 04'.4	41'.8
18	305° 16'.3	46° 02'.8	33'.2	146° 17'.3	27'.6	193° 19'.5	52'.5	84° 06'.5	41'.9
19	320° 18'.8	61° 02'.4	33'.5	161° 18'.4	27'.1	208° 21'.9	52'.5	99° 08'.7	42'.0
20	335° 21'.2	76° 02'.0	33'.8	176° 19'.5	26'.6	223° 24'.2	52'.5	114° 10'.9	42'.1
21	350° 23'.7	91° 01'.6	34'.1	191° 20'.6	26'.0	238° 26'.6	52'.5	129° 13'.1	42'.2
22	5° 26'.2	106° 01'.2	34'.3	206° 21'.6	25'.5	253° 29'.0	52'.5	144° 15'.2	42'.3
23	20° 28'.6	121° 00'.8	34'.6	221° 22'.7	25'.0	268° 31'.3	52'.5	159° 17'.4	42'.3
27 Sunday 00	35° 31'.1	136° 00'.4	26° 34'.9 S	236° 23'.8	10° 24'.5 N	283° 33'.7	21° 52'.5 N	174° 19'.6	13° 42'.4 S
01	50° 33'.6	151° 00'.1	35'.2	251° 24'.9	23'.9	298° 36'.1	52'.5	189° 21'.7	42'.5
02	65° 36'.0	165° 59'.7	35'.4	266° 25'.9	23'.4	313° 38'.4	52'.4	204° 23'.9	42'.6
03	80° 38'.5	180° 59'.3	35'.7	281° 27'.0	22'.9	328° 40'.8	52'.4	219° 26'.1	42'.7
04	95° 40'.9	195° 58'.9	36'.0	296° 28'.1	22'.4	343° 43'.2	52'.4	234° 28'.3	42'.8
05	110° 43'.4	210° 58'.5	36'.2	311° 29'.2	21'.9	358° 45'.5	52'.4	249° 30'.4	42'.9
06	125° 45'.9	225° 58'.1	36'.5	326° 30'.3	21'.3	13° 47'.9	52'.4	264° 32'.6	43'.0
07	140° 48'.3	240° 57'.7	36'.8	341° 31'.3	20'.8	28° 50'.3	52'.4	279° 34'.8	43'.1
08	155° 50'.8	255° 57'.3	37'.0	356° 32'.4	20'.3	43° 52'.6	52'.4	294° 37'.0	43'.2
09	170° 53'.3	270° 56'.9	37'.3	11° 33'.5	19'.8	58° 55'.0	52'.4	309° 39'.1	43'.3
10	185° 55'.7	285° 56'.5	37'.6	26° 34'.6	19'.2	73° 57'.4	52'.4	324° 41'.3	43'.3
11	200° 58'.2	300° 56'.1	37'.8	41° 35'.6	18'.7	88° 59'.7	52'.4	339° 43'.5	43'.4
12	216° 00'.7	315° 55'.7	26° 38'.1 S	56° 36'.7	10° 18'.2 N	104° 02'.1	21° 52'.4 N	354° 45'.6	13° 43'.5 S
13	231° 03'.1	330° 55'.4	38'.3	71° 37'.8	17'.7	119° 04'.5	52'.4	9° 47'.8	43'.6
14	246° 05'.6	345° 55'.0	38'.6	86° 38'.9	17'.2	134° 06'.8	52'.3	24° 50'.0	43'.7
15	261° 08'.0	0° 54'.6	38'.9	101° 40'.0	16'.6	149° 09'.2	52'.3	39° 52'.2	43'.8
16	276° 10'.5	15° 54'.2	39'.1	116° 41'.0	16'.1	164° 11'.6	52'.3	54° 54'.3	43'.9
17	291° 13'.0	30° 53'.8	39'.4	131° 42'.1	15'.6	179° 13'.9	52'.3	69° 56'.5	44'.0
18	306° 15'.4	45° 53'.4	39'.6	146° 43'.2	15'.1	194° 16'.3	52'.3	84° 58'.7	44'.1
19	321° 17'.9	60° 53'.0	39'.9	161° 44'.3	14'.5	209° 18'.7	52'.3	100° 00'.9	44'.2
20	336° 20'.4	75° 52'.6	40'.1	176° 45'.4	14'.0	224° 21'.1	52'.3	115° 03'.0	44'.3
21	351° 22'.8	90° 52'.3	40'.4	191° 46'.4	13'.5	239° 23'.4	52'.3	130° 05'.2	44'.3
22	6° 25'.3	105° 51'.9	40'.6	206° 47'.5	13'.0	254° 25'.8	52'.3	145° 07'.4	44'.4
23	21° 27'.8	120° 51'.5	40'.9	221° 48'.6	12'.5	269° 28'.2	52'.3	160° 09'.5	44'.5
	M.P. 21:38	v -0'.4	d 0'.3	v 1'.1	d 0'.5	v 2'.4	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.8	40° 14'.9 S
Achernar	335° 26'.1	57° 10'.0 S
Acrux	173° 09'.6	63° 10'.4 S
Adhara	255° 12'.2	28° 59'.4 S
Aldebaran	290° 48'.8	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.7 N
Alnair	27° 43'.3	46° 53'.6 S
Alnilam	275° 45'.9	1° 11'.6 S
Alphard	217° 55'.9	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.3 N
Alpheratz	357° 42'.9	29° 10'.2 N
Altair	62° 08'.0	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.8 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.2	69° 03'.1 S
Avior	234° 17'.9	59° 33'.1 S
Bellatrix	278° 31'.5	6° 21'.7 N
Betelgeuse	271° 00'.8	7° 24'.5 N
Canopus	263° 55'.8	52° 42'.1 S
Capella	280° 33'.7	46° 00'.5 N
Deneb	49° 31'.2	45° 20'.3 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.9	61° 40'.3 N
Elnath	278° 12'.1	28° 37'.0 N
Eltanin	90° 46'.3	51° 29'.7 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.9 S
Gacrux	172° 01'.1	57° 11'.3 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.3 S
Hamal	328° 00'.1	23° 31'.7 N
Kaus Aust.	83° 43'.7	34° 22'.6 S
Kochab	137° 21'.3	74° 06'.0 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.7	36° 26'.1 S
Miaplacidus	221° 39'.7	69° 46'.2 S
Mirfak	308° 39'.5	49° 54'.5 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 18'.9	56° 41'.5 S
Polaris	317° 11'.9	89° 19'.3 N
Pollux	243° 27'.4	27° 59'.3 N
Procyon	244° 59'.4	5° 11'.3 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 11'.6	8° 11'.2 S
Rigil Kent	139° 52'.0	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.6	56° 37'.0 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.4	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.3	43° 29'.2 S
Vega	80° 39'.0	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	101° 38'.1	14:56
Mars	201° 26'.1	08:16
Jupiter	248° 05'.1	05:09
Saturn	138° 55'.5	12:24

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 58'.5	12° 04'.5 S	292° 54'.9	12'.4	18° 22'.5 N	3'.4	54'.2
198° 58'.5	05'.4	307° 26'.3	12'.6	19'.1	3'.6	
213° 58'.6	06'.3	321° 57'.9	12'.5	15'.5	3'.6	
228° 58'.7	07'.1	336° 29'.4	12'.6	11'.9	3'.8	
243° 58'.7	08'.0	351° 01'.0	12'.6	08'.1	3'.8	
258° 58'.8	08'.9	5° 32'.6	12'.6	04'.3	3'.9	
273° 58'.9	09'.7	20° 04'.2	12'.6	00'.4	4'.0	
288° 59'.0	10'.6	34° 35'.8	12'.7	17° 56'.4 N	4'.0	
303° 59'.0	11'.4	49° 07'.5	12'.7	52'.4	4'.1	
318° 59'.1	12'.3	63° 39'.2	12'.7	48'.3	4'.2	
333° 59'.2	13'.2	78° 10'.9	12'.8	44'.1	4'.3	
348° 59'.2	14'.0	92° 42'.7	12'.8	39'.8	4'.4	
3° 59'.3	12° 14'.9 S	107° 14'.5	12'.8	17° 35'.4 N	4'.5	54'.2
18° 59'.4	15'.7	121° 46'.3	12'.9	30'.9	4'.5	
33° 59'.5	16'.6	136° 18'.2	12'.8	26'.4	4'.6	
48° 59'.5	17'.4	150° 50'.0	12'.9	21'.8	4'.7	
63° 59'.6	18'.3	165° 21'.9	12'.9	17'.1	4'.7	
78° 59'.7	19'.2	179° 53'.8	13'.0	12'.4	4'.9	
93° 59'.7	20'.0	194° 25'.8	13'.0	07'.5	4'.9	
108° 59'.8	20'.9	208° 57'.8	13'.0	02'.6	5'.0	
123° 59'.9	21'.7	223° 29'.8	13'.0	16° 57'.6 N	5'.0	
138° 59'.9	22'.6	238° 01'.8	13'.1	52'.6	5'.2	
154° 00'.0	23'.4	252° 33'.9	13'.0	47'.4	5'.2	
169° 00'.1	24'.3	267° 05'.9	13'.1	42'.2	5'.3	
184° 00'.1	12° 25'.1 S	281° 38'.0	13'.2	16° 36'.9 N	5'.3	54'.2
199° 00'.2	26'.0	296° 10'.2	13'.1	31'.6	5'.5	
214° 00'.3	26'.8	310° 42'.3	13'.2	26'.1	5'.5	
229° 00'.3	27'.7	325° 14'.5	13'.2	20'.6	5'.5	
244° 00'.4	28'.6	339° 46'.7	13'.3	15'.1	5'.7	
259° 00'.5	29'.4	354° 19'.0	13'.2	09'.4	5'.7	
274° 00'.5	30'.3	8° 51'.2	13'.3	03'.7	5'.8	
289° 00'.6	31'.1	23° 23'.5	13'.3	15° 57'.9 N	5'.9	
304° 00'.6	32'.0	37° 55'.8	13'.4	52'.0	5'.9	
319° 00'.7	32'.8	52° 28'.2	13'.3	46'.1	6'.0	54'.3
334° 00'.8	33'.7	67° 00'.5	13'.4	40'.1	6'.1	
349° 00'.8	34'.5	81° 32'.9	13'.4	34'.0	6'.1	
4° 00'.9	12° 35'.4 S	96° 05'.3	13'.4	15° 27'.9 N	6'.2	54'.3
19° 01'.0	36'.2	110° 37'.7	13'.5	21'.7	6'.3	
34° 01'.0	37'.1	125° 10'.2	13'.4	15'.4	6'.4	
49° 01'.1	37'.9	139° 42'.6	13'.5	09'.0	6'.4	
64° 01'.1	38'.8	154° 15'.1	13'.6	02'.6	6'.5	
79° 01'.2	39'.6	168° 47'.7	13'.5	14° 56'.1 N	6'.5	
94° 01'.3	40'.5	183° 20'.2	13'.6	49'.6	6'.7	
109° 01'.3	41'.3	197° 52'.8	13'.5	42'.9	6'.6	
124° 01'.4	42'.2	212° 25'.3	13'.6	36'.3	6'.8	
139° 01'.4	43'.0	226° 57'.9	13'.7	29'.5	6'.8	
154° 01'.5	43'.8	241° 30'.6	13'.6	22'.7	6'.9	54'.4
169° 01'.6	44'.7	256° 03'.2	13'.7	15'.8	6'.9	
184° 01'.6	12° 45'.5 S	270° 35'.9	13'.7	14° 08'.9 N	7'.0	54'.4
199° 01'.7	46'.4	285° 08'.6	13'.7	01'.9	7'.1	
214° 01'.7	47'.2	299° 41'.3	13'.7	13° 54'.8 N	7'.1	
229° 01'.8	48'.1	314° 14'.0	13'.7	47'.7	7'.2	
244° 01'.9	48'.9	328° 46'.7	13'.8	40'.5	7'.3	
259° 01'.9	49'.8	343° 19'.5	13'.7	33'.2	7'.3	
274° 02'.0	50'.6	357° 52'.2	13'.8	25'.9	7'.4	
289° 02'.0	51'.4	12° 25'.0	13'.8	18'.5	7'.4	54'.5
304° 02'.1	52'.3	26° 57'.8	13'.9	11'.1	7'.5	
319° 02'.1	53'.1	41° 30'.7	13'.8	03'.6	7'.6	
334° 02'.2	54'.0	56° 03'.5	13'.8	12° 56'.0 N	7'.6	
349° 02'.2	54'.8	70° 36'.3	13'.9	48'.4	7'.7	
4° 02'.3	12° 55'.7 S	85° 09'.2	13'.9	12° 40'.7 N	7'.7	54'.5
19° 02'.4	56'.5	99° 42'.1	13'.9	33'.0	7'.8	
34° 02'.4	57'.3	114° 15'.0	13'.9	25'.2	7'.9	
49° 02'.5	58'.2	128° 47'.9	13'.9	17'.3	7'.9	54'.6
64° 02'.5	59'.0	143° 20'.8	14'.0	09'.4	8'.0	
79° 02'.6	59'.9	157° 53'.8	13'.9	01'.4	8'.0	
94° 02'.6	13° 00'.7 S	172° 26'.7	14'.0	11° 53'.4 N	8'.1	
109° 02'.7	01'.5	186° 59'.7	13'.9	45'.3	8'.1	
124° 02'.7	02'.4	201° 32'.6	14'.0	37'.2	8'.2	
139° 02'.8	03'.2	216° 05'.6	14'.0	29'.0	8'.3	54'.7
154° 02'.8	04'.1	230° 38'.6	14'.0	20'.7	8'.3	
169° 02'.9	04'.9	245° 11'.6	14'.0	12'.4	8'.3	
SD 16'.1	d 0'.8	SD	14'.8	14'.8	14'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 25	Moonrise 26	Moonrise 27
N 72°	05:42	07:03	08:22	18:22	20:21	22:07
N 70°	05:41	06:53	08:02	19:18	20:52	22:27
68°	05:39	06:45	07:47	19:51	21:15	22:42
66°	05:38	06:38	07:34	20:15	21:33	22:54
64°	05:37	06:33	07:24	20:34	21:48	23:05
62°	05:36	06:28	07:15	20:49	22:00	23:13
60°	05:34	06:23	07:07	21:02	22:10	23:21
N 58°	05:33	06:19	07:00	21:13	22:19	23:27
56°	05:32	06:16	06:54	21:23	22:27	23:33
54°	05:31	06:12	06:49	21:31	22:33	23:38
52°	05:30	06:09	06:44	21:39	22:40	23:43
50°	05:29	06:06	06:40	21:46	22:45	23:47
45°	05:26	06:00	06:30	22:00	22:57	23:56
N 40°	05:23	05:55	06:22	22:12	23:07	24:04
35°	05:20	05:50	06:15	22:22	23:16	24:10
30°	05:17	05:45	06:09	22:31	23:23	24:16
20°	05:10	05:36	05:59	22:46	23:36	24:26
N 10°	05:03	05:28	05:49	23:00	23:47	24:35
0°	04:55	05:19	05:41	23:12	23:58	24:43
S 10°	04:45	05:10	05:32	23:25	-	00:08
20°	04:32	04:59	05:22	23:38	-	00:20
30°	04:16	04:46	05:11	23:53	-	00:32
35°	04:06	04:38	05:04	-	00:02	00:40
40°	03:53	04:28	04:57	-	00:12	00:48
45°	03:38	04:16	04:48	-	00:24	00:58
S 50°	03:18	04:02	04:37	00:02	00:38	01:10
52°	03:08	03:55	04:32	00:10	00:45	01:15
54°	02:57	03:48	04:27	00:18	00:52	01:21
56°	02:44	03:39	04:21	00:28	01:00	01:28
58°	02:28	03:29	04:14	00:39	01:10	01:35
S 60°	02:08	03:17	04:06	00:51	01:20	01:43
S 62°	01:43	03:04	03:58	01:05	01:32	01:53

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 25	Moonset 26	Moonset 27
N 72°	15:04	16:23	17:43	15:48	15:24	15:11
N 70°	15:24	16:33	17:45	14:51	14:52	14:50
68°	15:40	16:41	17:47	14:17	14:28	14:34
66°	15:53	16:48	17:48	13:53	14:09	14:21
64°	16:03	16:54	17:50	13:34	13:54	14:09
62°	16:12	16:59	17:51	13:18	13:42	14:00
60°	16:20	17:04	17:52	13:05	13:31	13:52
N 58°	16:27	17:08	17:54	12:53	13:21	13:45
56°	16:33	17:11	17:55	12:43	13:13	13:38
54°	16:38	17:15	17:56	12:35	13:06	13:32
52°	16:43	17:18	17:57	12:27	12:59	13:27
50°	16:47	17:21	17:58	12:20	12:53	13:23
45°	16:57	17:27	18:01	12:05	12:40	13:12
N 40°	17:05	17:33	18:04	11:52	12:30	13:04
35°	17:12	17:38	18:07	11:41	12:20	12:56
30°	17:18	17:43	18:11	11:32	12:12	12:50
20°	17:29	17:51	18:17	11:16	11:58	12:39
N 10°	17:38	18:00	18:25	11:02	11:46	12:29
0°	17:47	18:09	18:33	10:48	11:34	12:20
S 10°	17:56	18:18	18:43	10:35	11:23	12:10
20°	18:06	18:29	18:56	10:21	11:10	12:00
30°	18:18	18:43	19:12	10:04	10:56	11:49
35°	18:24	18:51	19:23	09:55	10:48	11:42
40°	18:32	19:01	19:35	09:44	10:38	11:34
45°	18:41	19:12	19:51	09:31	10:27	11:25
S 50°	18:52	19:27	20:11	09:15	10:14	11:15
52°	18:57	19:34	20:22	09:08	10:07	11:10
54°	19:02	19:42	20:33	09:00	10:00	11:04
56°	19:08	19:51	20:47	08:51	09:53	10:58
58°	19:15	20:01	21:03	08:40	09:44	10:51
S 60°	19:23	20:13	21:23	08:28	09:34	10:43
S 62°	19:32	20:27	21:50	08:14	09:22	10:34

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
25	15 54	15 57	11:44	04:37	17:00	20d 64%
26	16 00	16 03	11:44	05:23	17:46	21d 55%
27	16 06	16 09	11:44	06:09	18:31	22d 45%

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2013 October 28, 29, 30 (Mon, Tue, Wed)

GMT	ARIES	VENUS -4.4		MARS +1.5		JUPITER -2.4		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
28 Monday 00	36° 30'.2	135° 51'.1	26° 41'.1 S	236° 49'.7	10° 11'.9 N	284° 30'.6	21° 52'.3 N	175° 11'.7	13° 44'.6 S
01	51° 32'.7	150° 50'.7	41'.4	251° 50'.8	11'.4	299° 32'.9	52'.3	190° 13'.9	44'.7
02	66° 35'.2	165° 50'.3	41'.6	266° 51'.8	10'.9	314° 35'.3	52'.3	205° 16'.1	44'.8
03	81° 37'.6	180° 49'.9	41'.9	281° 52'.9	10'.4	329° 37'.7	52'.2	220° 18'.2	44'.9
04	96° 40'.1	195° 49'.6	42'.1	296° 54'.0	09'.8	344° 40'.1	52'.2	235° 20'.4	45'.0
05	111° 42'.5	210° 49'.2	42'.3	311° 55'.1	09'.3	359° 42'.4	52'.2	250° 22'.6	45'.1
06	126° 45'.0	225° 48'.8	42'.6	326° 56'.2	08'.8	14° 44'.8	52'.2	265° 24'.7	45'.2
07	141° 47'.5	240° 48'.4	42'.8	341° 57'.2	08'.3	29° 47'.2	52'.2	280° 26'.9	45'.3
08	156° 49'.9	255° 48'.0	43'.1	356° 58'.3	07'.7	44° 49'.6	52'.2	295° 29'.1	45'.3
09	171° 52'.4	270° 47'.7	43'.3	11° 59'.4	07'.2	59° 51'.9	52'.2	310° 31'.3	45'.4
10	186° 54'.9	285° 47'.3	43'.5	27° 00'.5	06'.7	74° 54'.3	52'.2	325° 33'.4	45'.5
11	201° 57'.3	300° 46'.9	43'.8	42° 01'.6	06'.2	89° 56'.7	52'.2	340° 35'.6	45'.6
12	216° 59'.8	315° 46'.5	26° 44'.0 S	57° 02'.7	10° 05'.7 N	104° 59'.1	21° 52'.2 N	355° 37'.8	13° 45'.7 S
13	232° 02'.3	330° 46'.1	44'.2	72° 03'.7	05'.1	120° 01'.4	52'.2	10° 40'.0	45'.8
14	247° 04'.7	345° 45'.8	44'.5	87° 04'.8	04'.6	135° 03'.8	52'.2	25° 42'.1	45'.9
15	262° 07'.2	0° 45'.4	44'.7	102° 05'.9	04'.1	150° 06'.2	52'.2	40° 44'.3	46'.0
16	277° 09'.7	15° 45'.0	44'.9	117° 07'.0	03'.6	165° 08'.6	52'.2	55° 46'.5	46'.1
17	292° 12'.1	30° 44'.6	45'.2	132° 08'.1	03'.0	180° 11'.0	52'.1	70° 48'.6	46'.2
18	307° 14'.6	45° 44'.2	45'.4	147° 09'.2	02'.5	195° 13'.3	52'.1	85° 50'.8	46'.3
19	322° 17'.0	60° 43'.9	45'.6	162° 10'.2	02'.0	210° 15'.7	52'.1	100° 53'.0	46'.3
20	337° 19'.5	75° 43'.5	45'.8	177° 11'.3	01'.5	225° 18'.1	52'.1	115° 55'.2	46'.4
21	352° 22'.0	90° 43'.1	46'.1	192° 12'.4	00'.9	240° 20'.5	52'.1	130° 57'.3	46'.5
22	7° 24'.4	105° 42'.7	46'.3	207° 13'.5	00'.4	255° 22'.9	52'.1	145° 59'.5	46'.6
23	22° 26'.9	120° 42'.4	46'.5	222° 14'.6	9° 59'.9 N	270° 25'.2	52'.1	161° 01'.7	46'.7
29 Tuesday 00	37° 29'.4	135° 42'.0	26° 46'.7 S	237° 15'.7	9° 59'.4 N	285° 27'.6	21° 52'.1 N	176° 03'.8	13° 46'.8 S
01	52° 31'.8	150° 41'.6	46'.9	252° 16'.7	58'.9	300° 30'.0	52'.1	191° 06'.0	46'.9
02	67° 34'.3	165° 41'.2	47'.2	267° 17'.8	58'.3	315° 32'.4	52'.1	206° 08'.2	47'.0
03	82° 36'.8	180° 40'.9	47'.4	282° 18'.9	57'.8	330° 34'.8	52'.1	221° 10'.4	47'.1
04	97° 39'.2	195° 40'.5	47'.6	297° 20'.0	57'.3	345° 37'.2	52'.1	236° 12'.5	47'.2
05	112° 41'.7	210° 40'.1	47'.8	312° 21'.1	56'.8	0° 39'.5	52'.1	251° 14'.7	47'.3
06	127° 44'.1	225° 39'.8	48'.0	327° 22'.2	56'.2	15° 41'.9	52'.1	266° 16'.9	47'.3
07	142° 46'.6	240° 39'.4	48'.2	342° 23'.3	55'.7	30° 44'.3	52'.1	281° 19'.0	47'.4
08	157° 49'.1	255° 39'.0	48'.5	357° 24'.3	55'.2	45° 46'.7	52'.0	296° 21'.2	47'.5
09	172° 51'.5	270° 38'.6	48'.7	12° 25'.4	54'.7	60° 49'.1	52'.0	311° 23'.4	47'.6
10	187° 54'.0	285° 38'.3	48'.9	27° 26'.5	54'.1	75° 51'.5	52'.0	326° 25'.6	47'.7
11	202° 56'.5	300° 37'.9	49'.1	42° 27'.6	53'.6	90° 53'.9	52'.0	341° 27'.7	47'.8
12	217° 58'.9	315° 37'.5	26° 49'.3 S	57° 28'.7	9° 53'.1 N	105° 56'.2	21° 52'.0 N	356° 29'.9	13° 47'.9 S
13	233° 01'.4	330° 37'.2	49'.5	72° 29'.8	52'.6	120° 58'.6	52'.0	11° 32'.1	48'.0
14	248° 03'.9	345° 36'.8	49'.7	87° 30'.9	52'.0	136° 01'.0	52'.0	26° 34'.2	48'.1
15	263° 06'.3	0° 36'.4	49'.9	102° 32'.0	51'.5	151° 03'.4	52'.0	41° 36'.4	48'.2
16	278° 08'.8	15° 36'.1	50'.1	117° 33'.0	51'.0	166° 05'.8	52'.0	56° 38'.6	48'.3
17	293° 11'.3	30° 35'.7	50'.3	132° 34'.1	50'.5	181° 08'.2	52'.0	71° 40'.8	48'.3
18	308° 13'.7	45° 35'.3	50'.5	147° 35'.2	50'.0	196° 10'.6	52'.0	86° 42'.9	48'.4
19	323° 16'.2	60° 35'.0	50'.7	162° 36'.3	49'.4	211° 13'.0	52'.0	101° 45'.1	48'.5
20	338° 18'.6	75° 34'.6	50'.9	177° 37'.4	48'.9	226° 15'.3	52'.0	116° 47'.3	48'.6
21	353° 21'.1	90° 34'.2	51'.1	192° 38'.5	48'.4	241° 17'.7	52'.0	131° 49'.4	48'.7
22	8° 23'.6	105° 33'.9	51'.3	207° 39'.6	47'.9	256° 20'.1	52'.0	146° 51'.6	48'.8
23	23° 26'.0	120° 33'.5	51'.5	222° 40'.7	47'.3	271° 22'.5	52'.0	161° 53'.8	48'.9
30 Wednesday 00	38° 28'.5	135° 33'.1	26° 51'.7 S	237° 41'.7	9° 46'.8 N	286° 24'.9	21° 52'.0 N	176° 56'.0	13° 49'.0 S
01	53° 31'.0	150° 32'.8	51'.9	252° 42'.8	46'.3	301° 27'.3	52'.0	191° 58'.1	49'.1
02	68° 33'.4	165° 32'.4	52'.1	267° 43'.9	45'.8	316° 29'.7	51'.9	207° 00'.3	49'.2
03	83° 35'.9	180° 32'.1	52'.3	282° 45'.0	45'.2	331° 32'.1	51'.9	222° 02'.5	49'.3
04	98° 38'.4	195° 31'.7	52'.5	297° 46'.1	44'.7	346° 34'.5	51'.9	237° 04'.6	49'.3
05	113° 40'.8	210° 31'.3	52'.7	312° 47'.2	44'.2	1° 36'.9	51'.9	252° 06'.8	49'.4
06	128° 43'.3	225° 31'.0	52'.9	327° 48'.3	43'.7	16° 39'.3	51'.9	267° 09'.0	49'.5
07	143° 45'.7	240° 30'.6	53'.1	342° 49'.4	43'.1	31° 41'.7	51'.9	282° 11'.2	49'.6
08	158° 48'.2	255° 30'.3	53'.2	357° 50'.5	42'.6	46° 44'.0	51'.9	297° 13'.3	49'.7
09	173° 50'.7	270° 29'.9	53'.4	12° 51'.6	42'.1	61° 46'.4	51'.9	312° 15'.5	49'.8
10	188° 53'.1	285° 29'.5	53'.6	27° 52'.7	41'.6	76° 48'.8	51'.9	327° 17'.7	49'.9
11	203° 55'.6	300° 29'.2	53'.8	42° 53'.7	41'.0	91° 51'.2	51'.9	342° 19'.8	50'.0
12	218° 58'.1	315° 28'.8	26° 54'.0 S	57° 54'.8	9° 40'.5 N	106° 53'.6	21° 51'.9 N	357° 22'.0	13° 50'.1 S
13	234° 00'.5	330° 28'.5	54'.2	72° 55'.9	40'.0	121° 56'.0	51'.9	12° 24'.2	50'.2
14	249° 03'.0	345° 28'.1	54'.3	87° 57'.0	39'.5	136° 58'.4	51'.9	27° 26'.4	50'.3
15	264° 05'.5	0° 27'.8	54'.5	102° 58'.1	38'.9	152° 00'.8	51'.9	42° 28'.5	50'.3
16	279° 07'.9	15° 27'.4	54'.7	117° 59'.2	38'.4	167° 03'.2	51'.9	57° 30'.7	50'.4
17	294° 10'.4	30° 27'.1	54'.9	133° 00'.3	37'.9	182° 05'.6	51'.9	72° 32'.9	50'.5
18	309° 12'.9	45° 26'.7	55'.0	148° 01'.4	37'.4	197° 08'.0	51'.9	87° 35'.0	50'.6
19	324° 15'.3	60° 26'.3	55'.2	163° 02'.5	36'.8	212° 10'.4	51'.9	102° 37'.2	50'.7
20	339° 17'.8	75° 26'.0	55'.4	178° 03'.6	36'.3	227° 12'.8	51'.9	117° 39'.4	50'.8
21	354° 20'.2	90° 25'.6	55'.6	193° 04'.7	35'.8	242° 15'.2	51'.9	132° 41'.5	50'.9
22	9° 22'.7	105° 25'.3	55'.7	208° 05'.8	35'.3	257° 17'.6	51'.9	147° 43'.7	51'.0
23	24° 25'.2	120° 24'.9	55'.9	223° 06'.9	34'.7	272° 20'.0	51'.9	162° 45'.9	51'.1
	M.P. 21:27	v -0'.4	d 0'.2	v 1'.1	d 0'.5	v 2'.4	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.8	40° 14'.9 S
Achernar	335° 26'.1	57° 10'.0 S
Acrux	173° 09'.6	63° 10'.4 S
Adhara	255° 12'.2	28° 59'.4 S
Aldebaran	290° 48'.8	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.7 N
Alnair	27° 43'.3	46° 53'.6 S
Alnilam	275° 45'.9	1° 11'.6 S
Alphard	217° 55'.9	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.3 N
Alpheratz	357° 42'.9	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.3	69° 03'.1 S
Avior	234° 17'.8	59° 33'.1 S
Bellatrix	278° 31'.5	6° 21'.6 N
Betelgeuse	271° 00'.8	7° 24'.5 N
Canopus	263° 55'.7	52° 42'.1 S
Capella	280° 33'.7	46° 00'.5 N
Deneb	49° 31'.3	45° 20'.3 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.9	61° 40'.3 N
Elnath	278° 12'.0	28° 37'.0 N
Eltanin	90° 46'.4	51° 29'.6 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.9 S
Gacrux	172° 01'.1	57° 11'.3 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.7 N
Kaus Aust.	83° 43'.7	34° 22'.6 S
Kochab	137° 21'.3	74° 06'.0 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.6	36° 26'.1 S
Miaplacidus	221° 39'.7	69° 46'.2 S
Mirfak	308° 39'.5	49° 54'.5 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 18'.9	56° 41'.5 S
Polaris	317° 11'.6	89° 19'.3 N
Pollux	243° 27'.4	27° 59'.3 N
Procyon	244° 59'.4	5° 11'.3 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 11'.6	8° 11'.2 S
Rigil Kent	139° 52'.0	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.6	56° 37'.0 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.3	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.3	43° 29'.2 S
Vega	80° 39'.0	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	98° 12'.6	14:58
Mars	199° 46'.3	08:10
Jupiter	247° 58'.3	04:57
Saturn	138° 34'.5	12:14

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
28 00	184° 02'.9	13° 05'.7 S	259° 44'.6	14'.0	11° 04'.1 N	8'.4	54'.7
01	199° 03'.0	06'.6	274° 17'.6	14'.1	10° 55'.7 N	8'.5	
02	214° 03'.0	07'.4	288° 50'.7	14'.0	47'.2	8'.5	
03	229° 03'.1	08'.2	303° 23'.7	14'.0	38'.7	8'.6	54'.8
04	244° 03'.1	09'.1	317° 56'.7	14'.1	30'.1	8'.6	
05	259° 03'.2	09'.9	332° 29'.8	14'.0	21'.5	8'.6	
06	274° 03'.2	10'.8	347° 02'.8	14'.1	12'.9	8'.7	
07	289° 03'.3	11'.6	1° 35'.9	14'.0	04'.2	8'.8	
08	304° 03'.3	12'.4	16° 08'.9	14'.1	9° 55'.4 N	8'.8	
09	319° 03'.4	13'.3	30° 42'.0	14'.1	46'.6	8'.9	54'.9
10	334° 03'.4	14'.1	45° 15'.1	14'.0	37'.7	8'.9	
11	349° 03'.5	14'.9	59° 48'.1	14'.1	28'.8	9'.0	
12	4° 03'.5	13° 15'.8 S	74° 21'.2	14'.1	9° 19'.8 N	9'.0	54'.9
13	19° 03'.5	16'.6	88° 54'.3	14'.1	10'.8	9'.0	55'.0
14	34° 03'.6	17'.4	103° 27'.4	14'.0	01'.8	9'.1	
15	49° 03'.6	18'.3	118° 00'.4	14'.1	8° 52'.7 N	9'.2	
16	64° 03'.7	19'.1	132° 33'.5	14'.1	43'.5	9'.2	
17	79° 03'.7	19'.9	147° 06'.6	14'.1	34'.3	9'.2	
18	94° 03'.8	20'.8	161° 39'.7	14'.0	25'.1	9'.3	55'.1
19	109° 03'.8	21'.6	176° 12'.7	14'.1	15'.8	9'.3	
20	124° 03'.9	22'.4	190° 45'.8	14'.1	06'.5	9'.4	
21	139° 03'.9	23'.2	205° 18'.9	14'.0	7° 57'.1 N	9'.4	
22	154° 03'.9	24'.1	219° 51'.9	14'.1	47'.7	9'.4	
23	169° 04'.0	24'.9	234° 25'.0	14'.1	38'.3	9'.5	55'.2
29 00	184° 04'.0	13° 25'.7 S	248° 58'.1	14'.0	7° 28'.8 N	9'.6	55'.2
01	199° 04'.1	26'.6	263° 31'.1	14'.0	19'.2	9'.6	
02	214° 04'.1	27'.4	278° 04'.1	14'.1	09'.6	9'.6	
03	229° 04'.2	28'.2	292° 37'.2	14'.0	00'.0	9'.6	55'.3
04	244° 04'.2	29'.0	307° 10'.2	14'.0	6° 50'.4 N	9'.7	
05	259° 04'.2	29'.9	321° 43'.2	14'.0	40'.7	9'.8	
06	274° 04'.3	30'.7	336° 16'.2	14'.0	30'.9	9'.7	
07	289° 04'.3	31'.5	350° 49'.2	14'.0	21'.2	9'.8	55'.4
08	304° 04'.4	32'.4	5° 22'.2	14'.0	11'.4	9'.9	
09	319° 04'.4	33'.2	19° 55'.2	14'.0	01'.5	9'.9	
10	334° 04'.4	34'.0	34° 28'.2	13'.9	5° 51'.6 N	9'.9	
11	349° 04'.5	34'.8	49° 01'.1	14'.0	41'.7	9'.9	55'.5
12	4° 04'.5	13° 35'.7 S	63° 34'.1	13'.9	5° 31'.8 N	10'.0	55'.5
13	19° 04'.5	36'.5	78° 07'.0	13'.9	21'.8	10'.1	
14	34° 04'.6	37'.3	92° 39'.9	13'.9	11'.7	10'.0	55'.6
15	49° 04'.6	38'.1	107° 12'.8	13'.9	01'.7	10'.1	
16	64° 04'.7	39'.0	121° 45'.7	13'.9	4° 51'.6 N	10'.1	
17	79° 04'.7	39'.8	136° 18'.6	13'.8	41'.5	10'.2	
18	94° 04'.7	40'.6	150° 51'.4	13'.8	31'.3	10'.2	55'.7
19	109° 04'.8	41'.4	165° 24'.2	13'.8	21'.1	10'.2	
20	124° 04'.8	42'.2	179° 57'.0	13'.8	10'.9	10'.2	
21	139° 04'.8	43'.1	194° 29'.8	13'.8	00'.7	10'.3	
22	154° 04'.9	43'.9	209° 02'.6	13'.8	3° 50'.4 N	10'.3	55'.8
23	169° 04'.9	44'.7	223° 35'.4	13'.7	40'.1	10'.3	
30 00	184° 04'.9	13° 45'.5 S	238° 08'.1	13'.7	3° 29'.8 N	10'.4	55'.8
01	199° 05'.0	46'.3	252° 40'.8	13'.7	19'.4	10'.4	55'.9
02	214° 05'.0	47'.2	267° 13'.5	13'.6	09'.0	10'.4	
03	229° 05'.0	48'.0	281° 46'.1	13'.7	2° 58'.6 N	10'.4	
04	244° 05'.1	48'.8	296° 18'.8	13'.6	48'.2	10'.5	
05	259° 05'.1	49'.6	310° 51'.4	13'.6	37'.7	10'.4	56'.0
06	274° 05'.1	50'.4	325° 24'.0	13'.5	27'.3	10'.5	
07	289° 05'.2	51'.3	339° 56'.5	13'.6	16'.8	10'.6	
08	304° 05'.2	52'.1	354° 29'.1	13'.5	06'.2	10'.5	56'.1
09	319° 05'.2	52'.9	9° 01'.6	13'.4	1° 55'.7 N	10'.6	
10	334° 05'.3	53'.7	23° 34'.0	13'.5	45'.1	10'.6	
11	349° 05'.3	54'.5	38° 06'.5	13'.4	34'.5	10'.6	56'.2
12	4° 05'.3	13° 55'.3 S	52° 38'.9	13'.4	1° 23'.9 N	10'.6	56'.2
13	19° 05'.4	56'.2	67° 11'.3	13'.3	13'.3	10'.7	
14	34° 05'.4	57'.0	81° 43'.6	13'.4	02'.6	10'.6	56'.3
15	49° 05'.4	57'.8	96° 16'.0	13'.2	0° 52'.0 N	10'.7	
16	64° 05'.4	58'.6	110° 48'.2	13'.3	41'.3	10'.7	
17	79° 05'.5	59'.4	125° 20'.5	13'.2	30'.6	10'.7	
18	94° 05'.5	14° 00'.2 S	139° 52'.7	13'.2	19'.9	10'.8	56'.4
19	109° 05'.5	01'.0	154° 24'.9	13'.1	09'.1	10'.7	
20	124° 05'.6	01'.8	168° 57'.0	13'.2	0° 01'.6 S	10'.8	
21	139° 05'.6	02'.7	183° 29'.2	13'.0	12'.4	10'.7	56'.5
22	154° 05'.6	03'.5	198° 01'.2	13'.1	23'.1	10'.8	
23	169° 05'.6	04'.3	212° 33'.3	12'.9	33'.9	10'.8	
	SD 16'.1	d 0'.8	SD	15'.0	15'.1	15'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 28	Moonrise 29	Moonrise 30
N 72°	05:55	07:16	08:39	23:50	-	01:32
N 70°	05:52	07:05	08:16	-	00:01	01:36
68°	05:49	06:56	07:59	-	00:10	01:40
66°	05:47	06:48	07:45	-	00:18	01:43
64°	05:45	06:41	07:33	-	00:24	01:45
62°	05:43	06:35	07:23	-	00:29	01:48
60°	05:41	06:30	07:15	-	00:34	01:50
N 58°	05:39	06:26	07:07	-	00:38	01:51
56°	05:38	06:22	07:01	-	00:42	01:53
54°	05:36	06:18	06:55	-	00:45	01:54
52°	05:35	06:14	06:50	-	00:48	01:55
50°	05:33	06:11	06:45	-	00:51	01:57
45°	05:29	06:04	06:34	-	00:57	01:59
N 40°	05:26	05:58	06:26	00:04	01:02	02:01
35°	05:22	05:52	06:18	00:10	01:06	02:03
30°	05:19	05:47	06:12	00:16	01:10	02:04
20°	05:11	05:38	06:00	00:26	01:16	02:07
N 10°	05:03	05:28	05:50	00:35	01:22	02:10
0°	04:54	05:19	05:40	00:43	01:27	02:12
S 10°	04:44	05:09	05:31	00:51	01:32	02:14
20°	04:30	04:57	05:20	00:59	01:38	02:17
30°	04:13	04:43	05:08	01:09	01:44	02:19
35°	04:02	04:34	05:01	01:15	01:48	02:21
40°	03:49	04:24	04:53	01:21	01:52	02:23
45°	03:32	04:11	04:43	01:28	01:57	02:25
S 50°	03:11	03:56	04:32	01:37	02:03	02:27
52°	03:00	03:49	04:26	01:41	02:06	02:28
54°	02:48	03:40	04:20	01:46	02:08	02:30
56°	02:34	03:31	04:14	01:51	02:12	02:31
58°	02:16	03:20	04:06	01:56	02:15	02:33
S 60°	01:54	03:08	03:58	02:03	02:19	02:34
S 62°	01:24	02:53	03:48	02:10	02:24	02:36

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 28	Moonset 29	Moonset 30
N 72°	14:47	16:10	17:31	15:01	14:53	14:44
N 70°	15:10	16:21	17:34	14:48	14:46	14:43
68°	15:27	16:30	17:37	14:38	14:40	14:42
66°	15:41	16:38	17:39	14:29	14:36	14:42
64°	15:53	16:45	17:41	14:21	14:32	14:41
62°	16:03	16:51	17:43	14:15	14:28	14:40
60°	16:12	16:56	17:45	14:09	14:25	14:40
N 58°	16:19	17:01	17:47	14:04	14:22	14:39
56°	16:26	17:05	17:49	14:00	14:20	14:39
54°	16:32	17:09	17:50	13:56	14:18	14:39
52°	16:37	17:12	17:52	13:52	14:16	14:38
50°	16:42	17:16	17:54	13:49	14:14	14:38
45°	16:52	17:23	17:57	13:42	14:10	14:37
N 40°	17:01	17:29	18:01	13:36	14:06	14:37
35°	17:09	17:35	18:05	13:31	14:03	14:36
30°	17:15	17:40	18:08	13:26	14:01	14:36
20°	17:27	17:50	18:16	13:18	13:56	14:35
N 10°	17:37	17:59	18:24	13:11	13:52	14:34
0°	17:47	18:08	18:33	13:04	13:49	14:34
S 10°	17:57	18:19	18:44	12:57	13:45	14:33
20°	18:08	18:31	18:57	12:50	13:41	14:32
30°	18:20	18:45	19:15	12:42	13:36	14:31
35°	18:27	18:54	19:26	12:37	13:33	14:31
40°	18:35	19:04	19:39	12:32	13:30	14:30
45°	18:45	19:17	19:56	12:25	13:26	14:30
S 50°	18:57	19:33	20:18	12:18	13:22	14:29
52°	19:02	19:40	20:29	12:14	13:20	14:28
54°	19:08	19:49	20:41	12:10	13:18	14:28
56°	19:15	19:58	20:56	12:06	13:15	14:27
58°	19:23	20:09	21:14	12:01	13:13	14:27
S 60°	19:31	20:22	21:37	11:55	13:10	14:26
S 62°	19:41	20:38	22:09	11:49	13:06	14:26

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
28	16 12	16 14	11:44	06:53	19:16	23d 36%
29	16 16	16 18	11:44	07:38	20:00	24d 27%
30	16 20	16 21	11:44	08:23	20:46	25d 18%

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2013 Oct 31, Nov. 1, 2 (Thur, Fri, Saturday)

GMT	ARIES	VENUS -4.4		MARS +1.5		JUPITER -2.4		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
31 Thursday 00	39° 27'.6	135° 24'.6	26° 56'.1 S	238° 08'.0	9° 34'.2 N	287° 22'.4	21° 51'.8 N	177° 48'.1	13° 51'.2 S
01	54° 30'.1	150° 24'.2	56'.3	253° 09'.0	33'.7	302° 24'.8	51'.8	192° 50'.2	51'.2
02	69° 32'.6	165° 23'.9	56'.4	268° 10'.1	33'.2	317° 27'.2	51'.8	207° 52'.4	51'.3
03	84° 35'.0	180° 23'.5	56'.6	283° 11'.2	32'.6	332° 29'.6	51'.8	222° 54'.6	51'.4
04	99° 37'.5	195° 23'.2	56'.7	298° 12'.3	32'.1	347° 32'.0	51'.8	237° 56'.7	51'.5
05	114° 40'.0	210° 22'.8	56'.9	313° 13'.4	31'.6	2° 34'.4	51'.8	252° 58'.9	51'.6
06	129° 42'.4	225° 22'.5	57'.1	328° 14'.5	31'.1	17° 36'.8	51'.8	268° 01'.1	51'.7
07	144° 44'.9	240° 22'.2	57'.2	343° 15'.6	30'.5	32° 39'.2	51'.8	283° 03'.3	51'.8
08	159° 47'.4	255° 21'.8	57'.4	358° 16'.7	30'.0	47° 41'.6	51'.8	298° 05'.4	51'.9
09	174° 49'.8	270° 21'.5	57'.6	13° 17'.8	29'.5	62° 44'.0	51'.8	313° 07'.6	52'.0
10	189° 52'.3	285° 21'.1	57'.7	28° 18'.9	29'.0	77° 46'.4	51'.8	328° 09'.8	52'.1
11	204° 54'.7	300° 20'.8	57'.9	43° 20'.0	28'.4	92° 48'.8	51'.8	343° 11'.9	52'.2
12	219° 57'.2	315° 20'.4	26° 58'.0 S	58° 21'.1	9° 27'.9 N	107° 51'.2	21° 51'.8 N	358° 14'.1	13° 52'.2 S
13	234° 59'.7	330° 20'.1	58'.2	73° 22'.2	27'.4	122° 53'.6	51'.8	13° 16'.3	52'.3
14	250° 02'.1	345° 19'.7	58'.3	88° 23'.3	26'.9	137° 56'.0	51'.8	28° 18'.4	52'.4
15	265° 04'.6	0° 19'.4	58'.5	103° 24'.4	26'.3	152° 58'.4	51'.8	43° 20'.6	52'.5
16	280° 07'.1	15° 19'.1	58'.7	118° 25'.5	25'.8	168° 00'.8	51'.8	58° 22'.8	52'.6
17	295° 09'.5	30° 18'.7	58'.8	133° 26'.6	25'.3	183° 03'.2	51'.8	73° 25'.0	52'.7
18	310° 12'.0	45° 18'.4	59'.0	148° 27'.7	24'.8	198° 05'.6	51'.8	88° 27'.1	52'.8
19	325° 14'.5	60° 18'.0	59'.1	163° 28'.8	24'.2	213° 08'.1	51'.8	103° 29'.3	52'.9
20	340° 16'.9	75° 17'.7	59'.3	178° 29'.9	23'.7	228° 10'.5	51'.8	118° 31'.5	53'.0
21	355° 19'.4	90° 17'.4	59'.4	193° 31'.0	23'.2	243° 12'.9	51'.8	133° 33'.6	53'.1
22	10° 21'.8	105° 17'.0	59'.5	208° 32'.1	22'.7	258° 15'.3	51'.8	148° 35'.8	53'.1
23	25° 24'.3	120° 16'.7	59'.7	223° 33'.2	22'.1	273° 17'.7	51'.8	163° 38'.0	53'.2
1 Friday 00	40° 26'.8	135° 16'.3	26° 59'.8 S	238° 34'.3	9° 21'.6 N	288° 20'.1	21° 51'.8 N	178° 40'.1	13° 53'.3 S
01	55° 29'.2	150° 16'.0	27° 00'.0 S	253° 35'.4	21'.1	303° 22'.5	51'.8	193° 42'.3	53'.4
02	70° 31'.7	165° 15'.7	00'.1	268° 36'.5	20'.6	318° 24'.9	51'.8	208° 44'.5	53'.5
03	85° 34'.2	180° 15'.3	00'.3	283° 37'.6	20'.0	333° 27'.3	51'.8	223° 46'.7	53'.6
04	100° 36'.6	195° 15'.0	00'.4	298° 38'.7	19'.5	348° 29'.7	51'.8	238° 48'.8	53'.7
05	115° 39'.1	210° 14'.7	00'.5	313° 39'.8	19'.0	3° 32'.1	51'.8	253° 51'.0	53'.8
06	130° 41'.6	225° 14'.3	00'.7	328° 40'.9	18'.5	18° 34'.5	51'.8	268° 53'.2	53'.9
07	145° 44'.0	240° 14'.0	00'.8	343° 42'.0	17'.9	33° 37'.0	51'.7	283° 55'.3	54'.0
08	160° 46'.5	255° 13'.7	00'.9	358° 43'.1	17'.4	48° 39'.4	51'.7	298° 57'.5	54'.1
09	175° 49'.0	270° 13'.3	01'.1	13° 44'.2	16'.9	63° 41'.8	51'.7	313° 59'.7	54'.1
10	190° 51'.4	285° 13'.0	01'.2	28° 45'.3	16'.4	78° 44'.2	51'.7	329° 01'.9	54'.2
11	205° 53'.9	300° 12'.7	01'.3	43° 46'.4	15'.8	93° 46'.6	51'.7	344° 04'.0	54'.3
12	220° 56'.3	315° 12'.4	27° 01'.5 S	58° 47'.5	9° 15'.3 N	108° 49'.0	21° 51'.7 N	359° 06'.2	13° 54'.4 S
13	235° 58'.8	330° 12'.0	01'.6	73° 48'.6	14'.8	123° 51'.4	51'.7	14° 08'.4	54'.5
14	251° 01'.3	345° 11'.7	01'.7	88° 49'.7	14'.3	138° 53'.8	51'.7	29° 10'.5	54'.6
15	266° 03'.7	0° 11'.4	01'.9	103° 50'.8	13'.7	153° 56'.3	51'.7	44° 12'.7	54'.7
16	281° 06'.2	15° 11'.0	02'.0	118° 51'.9	13'.2	168° 58'.7	51'.7	59° 14'.9	54'.8
17	296° 08'.7	30° 10'.7	02'.1	133° 53'.0	12'.7	184° 01'.1	51'.7	74° 17'.0	54'.9
18	311° 11'.1	45° 10'.4	02'.2	148° 54'.1	12'.2	199° 03'.5	51'.7	89° 19'.2	55'.0
19	326° 13'.6	60° 10'.1	02'.4	163° 55'.2	11'.6	214° 05'.9	51'.7	104° 21'.4	55'.0
20	341° 16'.1	75° 09'.7	02'.5	178° 56'.3	11'.1	229° 08'.3	51'.7	119° 23'.6	55'.1
21	356° 18'.5	90° 09'.4	02'.6	193° 57'.4	10'.6	244° 10'.7	51'.7	134° 25'.7	55'.2
22	11° 21'.0	105° 09'.1	02'.7	208° 58'.5	10'.1	259° 13'.2	51'.7	149° 27'.9	55'.3
23	26° 23'.4	120° 08'.8	02'.9	223° 59'.6	09'.5	274° 15'.6	51'.7	164° 30'.1	55'.4
2 Saturday 00	41° 25'.9	135° 08'.5	27° 03'.0 S	239° 00'.7	9° 09'.0 N	289° 18'.0	21° 51'.7 N	179° 32'.2	13° 55'.5 S
01	56° 28'.4	150° 08'.1	03'.1	254° 01'.8	08'.5	304° 20'.4	51'.7	194° 34'.4	55'.6
02	71° 30'.8	165° 07'.8	03'.2	269° 02'.9	08'.0	319° 22'.8	51'.7	209° 36'.6	55'.7
03	86° 33'.3	180° 07'.5	03'.3	284° 04'.0	07'.4	334° 25'.2	51'.7	224° 38'.7	55'.8
04	101° 35'.8	195° 07'.2	03'.4	299° 05'.1	06'.9	349° 27'.7	51'.7	239° 40'.9	55'.9
05	116° 38'.2	210° 06'.9	03'.5	314° 06'.2	06'.4	4° 30'.1	51'.7	254° 43'.1	55'.9
06	131° 40'.7	225° 06'.5	03'.7	329° 07'.3	05'.9	19° 32'.5	51'.7	269° 45'.2	56'.0
07	146° 43'.2	240° 06'.2	03'.8	344° 08'.4	05'.3	34° 34'.9	51'.7	284° 47'.4	56'.1
08	161° 45'.6	255° 05'.9	03'.9	359° 09'.5	04'.8	49° 37'.3	51'.7	299° 49'.6	56'.2
09	176° 48'.1	270° 05'.6	04'.0	14° 10'.6	04'.3	64° 39'.8	51'.7	314° 51'.8	56'.3
10	191° 50'.6	285° 05'.3	04'.1	29° 11'.7	03'.8	79° 42'.2	51'.7	329° 53'.9	56'.4
11	206° 53'.0	300° 05'.0	04'.2	44° 12'.8	03'.2	94° 44'.6	51'.7	344° 56'.1	56'.5
12	221° 55'.5	315° 04'.6	27° 04'.3 S	59° 13'.9	9° 02'.7 N	109° 47'.0	21° 51'.7 N	359° 58'.3	13° 56'.6 S
13	236° 57'.9	330° 04'.3	04'.4	74° 15'.0	02'.2	124° 49'.5	51'.7	15° 00'.4	56'.7
14	252° 00'.4	345° 04'.0	04'.5	89° 16'.1	01'.7	139° 51'.9	51'.7	30° 02'.6	56'.8
15	267° 02'.9	0° 03'.7	04'.6	104° 17'.2	01'.1	154° 54'.3	51'.7	45° 04'.8	56'.8
16	282° 05'.3	15° 03'.4	04'.7	119° 18'.4	00'.6	169° 56'.7	51'.7	60° 06'.9	56'.9
17	297° 07'.8	30° 03'.1	04'.8	134° 19'.5	00'.1	184° 59'.1	51'.7	75° 09'.1	57'.0
18	312° 10'.3	45° 02'.8	04'.9	149° 20'.6	8° 59'.5 N	200° 01'.6	51'.7	90° 11'.3	57'.1
19	327° 12'.7	60° 02'.5	05'.0	164° 21'.7	59'.0	215° 04'.0	51'.7	105° 13'.5	57'.2
20	342° 15'.2	75° 02'.2	05'.1	179° 22'.8	58'.5	230° 06'.4	51'.7	120° 15'.6	57'.3
21	357° 17'.7	90° 01'.8	05'.2	194° 23'.9	58'.0	245° 08'.8	51'.7	135° 17'.8	57'.4
22	12° 20'.1	105° 01'.5	05'.3	209° 25'.0	57'.4	260° 11'.3	51'.7	150° 20'.0	57'.5
23	27° 22'.6	120° 01'.2	05'.4	224° 26'.1	56'.9	275° 13'.7	51'.7	165° 22'.1	57'.6
	M.P. 21:15	v -0'.3	d 0'.1	v 1'.1	d 0'.5	v 2'.4	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 14'.9 S
Achernar	335° 26'.1	57° 10'.0 S
Acrux	173° 09'.5	63° 10'.4 S
Adhara	255° 12'.2	28° 59'.4 S
Aldebaran	290° 48'.8	16° 32'.1 N
Alioth	166° 21'.1	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.7 N
Alnair	27° 43'.3	46° 53'.7 S
Alnilam	275° 45'.9	1° 11'.6 S
Alphard	217° 55'.9	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.3 N
Alpheratz	357° 42'.9	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.1	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.8 N
Atria	107° 28'.3	69° 03'.1 S
Avior	234° 17'.8	59° 33'.1 S
Bellatrix	278° 31'.5	6° 21'.6 N
Betelgeuse	271° 00'.8	7° 24'.5 N
Canopus	263° 55'.7	52° 42'.1 S
Capella	280° 33'.7	46° 00'.5 N
Deneb	49° 31'.3	45° 20'.3 N
Denebola	182° 33'.7	14° 29'.7 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.9	61° 40'.3 N
Elnath	278° 12'.0	28° 37'.0 N
Eltanin	90° 46'.4	51° 29'.6 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.9 S
Gacrux	172° 01'.0	57° 11'.3 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.7 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 21'.3	74° 06'.0 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.6	36° 26'.1 S
Miaplacidus	221° 39'.6	69° 46'.2 S
Mirfak	308° 39'.5	49° 54'.5 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 18'.9	56° 41'.5 S
Polaris	317° 11'.3	89° 19'.3 N
Pollux	243° 27'.3	27° 59'.3 N
Procyon	244° 59'.4	5° 11'.3 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 11'.6	8° 11'.2 S
Rigil Kent	139° 52'.0	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.0 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.3	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.3	43° 29'.2 S
Vega	80° 39'.0	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	94° 49'.6	14:59
Mars	198° 07'.5	08:05
Jupiter	247° 53'.3	04:46
Saturn	138° 13'.4	12:04

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
184° 05'.7	14° 05'.1 S	227° 05'.2	13'.0	0° 44'.7 S	10'.8	56'.6
199° 05'.7	05'.9	241° 37'.2	12'.9	55'.5	10'.8	
214° 05'.7	06'.7	256° 09'.1	12'.9	1° 06'.3 S	10'.8	
229° 05'.7	07'.5	270° 41'.0	12'.8	17'.1	10'.8	56'.7
244° 05'.8	08'.3	285° 12'.8	12'.8	27'.9	10'.9	
259° 05'.8	09'.1	299° 44'.6	12'.7	38'.8	10'.8	
274° 05'.8	10'.0	314° 16'.3	12'.7	49'.6	10'.8	56'.8
289° 05'.8	10'.8	328° 48'.0	12'.7	2° 00'.4 S	10'.9	
304° 05'.8	11'.6	343° 19'.7	12'.6	11'.3	10'.8	
319° 05'.9	12'.4	357° 51'.3	12'.6	22'.1	10'.9	56'.9
334° 05'.9	13'.2	12° 22'.9	12'.5	33'.0	10'.8	
349° 05'.9	14'.0	26° 54'.4	12'.5	43'.8	10'.9	
4° 05'.9	14° 14'.8 S	41° 25'.9	12'.4	2° 54'.7 S	10'.8	57'.0
19° 06'.0	15'.6	55° 57'.3	12'.3	3° 05'.5 S	10'.9	
34° 06'.0	16'.4	70° 28'.6	12'.4	16'.4	10'.8	
49° 06'.0	17'.2	85° 00'.0	12'.2	27'.2	10'.9	57'.1
64° 06'.0	18'.0	99° 31'.2	12'.3	38'.1	10'.8	
79° 06'.0	18'.8	114° 02'.5	12'.1	48'.9	10'.8	
94° 06'.1	19'.6	128° 33'.6	12'.1	59'.7	10'.9	57'.2
109° 06'.1	20'.4	143° 04'.7	12'.1	4° 10'.6 S	10'.8	
124° 06'.1	21'.2	157° 35'.8	12'.0	21'.4	10'.8	
139° 06'.1	22'.0	172° 06'.8	11'.9	32'.2	10'.8	57'.3
154° 06'.1	22'.8	186° 37'.7	11'.9	43'.0	10'.8	
169° 06'.2	23'.6	201° 08'.6	11'.9	53'.8	10'.8	
184° 06'.2	14° 24'.4 S	215° 39'.5	11'.8	5° 04'.6 S	10'.7	57'.4
199° 06'.2	25'.2	230° 10'.3	11'.7	15'.3	10'.8	
214° 06'.2	26'.0	244° 41'.0	11'.7	26'.1	10'.7	
229° 06'.2	26'.8	259° 11'.7	11'.6	36'.8	10'.7	57'.5
244° 06'.2	27'.6	273° 42'.3	11'.5	47'.5	10'.7	
259° 06'.2	28'.4	288° 12'.8	11'.5	58'.2	10'.7	
274° 06'.3	29'.2	302° 43'.3	11'.4	6° 08'.9 S	10'.7	57'.6
289° 06'.3	30'.0	317° 13'.7	11'.4	19'.6	10'.6	
304° 06'.3	30'.8	331° 44'.1	11'.3	30'.2	10'.7	
319° 06'.3	31'.6	346° 14'.4	11'.3	40'.9	10'.6	57'.7
334° 06'.3	32'.4	0° 44'.7	11'.1	51'.5	10'.6	
349° 06'.3	33'.2	15° 14'.8	11'.2	7° 02'.1 S	10'.5	
4° 06'.3	14° 34'.0 S	29° 45'.0	11'.0	7° 12'.6 S	10'.6	57'.8
19° 06'.4	34'.8	44° 15'.0	11'.0	23'.2	10'.5	
34° 06'.4	35'.6	58° 45'.0	10'.9	33'.7	10'.4	
49° 06'.4	36'.4	73° 14'.9	10'.9	44'.1	10'.5	57'.9
64° 06'.4	37'.2	87° 44'.8	10'.8	54'.6	10'.4	
79° 06'.4	38'.0	102° 14'.6	10'.7	8° 05'.0 S	10'.4	
94° 06'.4	38'.8	116° 44'.3	10'.7	15'.4	10'.4	58'.0
109° 06'.4	39'.6	131° 14'.0	10'.5	25'.8	10'.3	
124° 06'.4	40'.4	145° 43'.5	10'.6	36'.1	10'.3	
139° 06'.5	41'.2	160° 13'.1	10'.4	46'.4	10'.2	58'.1
154° 06'.5	42'.0	174° 42'.5	10'.4	56'.6	10'.3	
169° 06'.5	42'.8	189° 11'.9	10'.3	9° 06'.9 S	10'.1	
184° 06'.5	14° 43'.6 S	203° 41'.2	10'.3	9° 17'.0 S	10'.2	58'.1
199° 06'.5	44'.3	218° 10'.5	10'.2	27'.2	10'.1	58'.2
214° 06'.5	45'.1	232° 39'.7	10'.1	37'.3	10'.0	
229° 06'.5	45'.9	247° 08'.8	10'.0	47'.3	10'.1	
244° 06'.5	46'.7	261° 37'.8	10'.0	57'.4	9'.9	58'.3
259° 06'.5	47'.5	276° 06'.8	9'.8	10° 07'.3 S	9'.9	
274° 06'.5	48'.3	290° 35'.6	9'.9	17'.2	9'.9	
289° 06'.5	49'.1	305° 04'.5	9'.7	27'.1	9'.9	58'.4
304° 06'.5	49'.9	319° 33'.2	9'.7	37'.0	9'.7	
319° 06'.5	50'.7	334° 01'.9	9'.6	46'.7	9'.8	
334° 06'.5	51'.4	348° 30'.5	9'.5	56'.5	9'.6	58'.5
349° 06'.6	52'.2	2° 59'.0	9'.5	11° 06'.1 S	9'.7	
4° 06'.6	14° 53'.0 S	17° 27'.5	9'.4	11° 15'.8 S	9'.5	58'.5
19° 06'.6	53'.8	31° 55'.9	9'.3	25'.3	9'.5	
34° 06'.6	54'.6	46° 24'.2	9'.2	34'.8	9'.5	58'.6
49° 06'.6	55'.4	60° 52'.4	9'.2	44'.3	9'.4	
64° 06'.6	56'.2	75° 20'.6	9'.1	53'.7	9'.3	
79° 06'.6	56'.9	89° 48'.7	9'.0	12° 03'.0 S	9'.3	58'.7
94° 06'.6	57'.7	104° 16'.7	8'.9	12'.3	9'.2	
109° 06'.6	58'.5	118° 44'.6	8'.9	21'.5	9'.2	
124° 06'.6	59'.3	133° 12'.5	8'.8	30'.7	9'.1	
139° 06'.6	15° 00'.1 S	147° 40'.3	8'.7	39'.8	9'.0	58'.8
154° 06'.6	00'.9	162° 08'.0	8'.6	48'.8	8'.9	
169° 06'.6	01'.6	176° 35'.6	8'.6	57'.7	8'.9	
SD 16'.1	d 0'.8	SD	15'.5	15'.7	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 31	Moonrise 1	Moonrise 2
N 72°	06:07	07:30	08:58	03:16	05:04	07:00
N 70°	06:02	07:17	08:31	03:14	04:55	06:42
68°	05:59	07:06	08:11	03:12	04:48	06:28
66°	05:56	06:57	07:56	03:11	04:42	06:16
64°	05:53	06:50	07:43	03:09	04:37	06:07
62°	05:50	06:43	07:32	03:08	04:32	05:59
60°	05:48	06:37	07:22	03:08	04:28	05:52
N 58°	05:45	06:32	07:14	03:07	04:25	05:46
56°	05:43	06:27	07:07	03:06	04:22	05:40
54°	05:41	06:23	07:01	03:05	04:19	05:35
52°	05:39	06:19	06:55	03:05	04:17	05:31
50°	05:38	06:16	06:50	03:04	04:14	05:27
45°	05:33	06:08	06:38	03:03	04:10	05:18
N 40°	05:29	06:01	06:29	03:02	04:06	05:11
35°	05:25	05:55	06:21	03:02	04:02	05:05
30°	05:21	05:49	06:14	03:01	03:59	05:00
20°	05:13	05:39	06:01	03:00	03:54	04:51
N 10°	05:04	05:29	05:51	02:59	03:49	04:43
0°	04:54	05:19	05:40	02:58	03:45	04:35
S 10°	04:42	05:08	05:30	02:57	03:41	04:28
20°	04:28	04:55	05:18	02:56	03:37	04:20
30°	04:10	04:40	05:05	02:55	03:32	04:11
35°	03:58	04:31	04:58	02:54	03:29	04:06
40°	03:44	04:20	04:49	02:53	03:26	04:00
45°	03:27	04:07	04:39	02:53	03:22	03:54
S 50°	03:04	03:50	04:26	02:52	03:17	03:46
52°	02:53	03:42	04:21	02:51	03:15	03:42
54°	02:39	03:33	04:14	02:51	03:13	03:38
56°	02:24	03:23	04:07	02:50	03:11	03:34
58°	02:04	03:11	03:59	02:50	03:08	03:29
S 60°	01:39	02:58	03:50	02:49	03:05	03:23
S 62°	01:03	02:41	03:39	02:49	03:02	03:17

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 31	Moonset 1	Moonset 2
N 72°	14:28	15:56	17:19	14:36	14:26	14:15
N 70°	14:55	16:09	17:23	14:40	14:38	14:35
68°	15:15	16:20	17:27	14:44	14:47	14:51
66°	15:30	16:29	17:30	14:48	14:55	15:04
64°	15:43	16:36	17:33	14:50	15:01	15:14
62°	15:54	16:43	17:36	14:53	15:07	15:23
60°	16:04	16:49	17:38	14:55	15:12	15:31
N 58°	16:12	16:54	17:41	14:57	15:16	15:38
56°	16:19	16:59	17:43	14:59	15:20	15:44
54°	16:26	17:03	17:45	15:00	15:23	15:50
52°	16:31	17:07	17:47	15:01	15:27	15:55
50°	16:37	17:11	17:49	15:03	15:29	16:00
45°	16:48	17:19	17:53	15:06	15:36	16:09
N 40°	16:58	17:26	17:58	15:08	15:41	16:18
35°	17:06	17:32	18:02	15:10	15:46	16:25
30°	17:13	17:38	18:06	15:12	15:50	16:31
20°	17:25	17:48	18:14	15:15	15:57	16:42
N 10°	17:37	17:58	18:23	15:18	16:03	16:51
0°	17:47	18:08	18:33	15:20	16:09	17:00
S 10°	17:58	18:19	18:45	15:23	16:15	17:09
20°	18:09	18:32	18:59	15:25	16:21	17:19
30°	18:22	18:48	19:18	15:29	16:28	17:30
35°	18:30	18:57	19:29	15:30	16:32	17:36
40°	18:39	19:08	19:44	15:32	16:37	17:43
45°	18:49	19:22	20:01	15:35	16:42	17:52
S 50°	19:02	19:38	20:25	15:37	16:49	18:02
52°	19:08	19:46	20:36	15:39	16:52	18:07
54°	19:14	19:55	20:50	15:40	16:55	18:12
56°	19:22	20:06	21:06	15:42	16:59	18:18
58°	19:30	20:18	21:26	15:43	17:03	18:24
S 60°	19:39	20:32	21:52	15:45	17:07	18:31
S 62°	19:50	20:49	22:32	15:48	17:12	18:40

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
31	16 23	16 24	11:44	09:09	21:33	26d 11%
1	16 25	16 25	11:44	09:57	22:22	27d 5%
2	16 26	16 26	11:44	10:48	23:14	28d 1%

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2013 November 3, 4, 5 (Sun, Mon, Tue)

GMT	ARIES	VENUS -4.4		MARS +1.5		JUPITER -2.4		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
3 Sunday 00	42° 25'.1	135° 00'.9	27° 05'.5 S	239° 27'.2	8° 56'.4 N	290° 16'.1	21° 51'.7 N	180° 24'.3	13° 57'.7 S
01	57° 27'.5	150° 00'.6	05'.6	254° 28'.3	55'.9	305° 18'.5	51'.7	195° 26'.5	57'.7
02	72° 30'.0	165° 00'.3	05'.7	269° 29'.4	55'.3	320° 21'.0	51'.7	210° 28'.6	57'.8
03	87° 32'.4	180° 00'.0	05'.8	284° 30'.5	54'.8	335° 23'.4	51'.7	225° 30'.8	57'.9
04	102° 34'.9	194° 59'.7	05'.9	299° 31'.6	54'.3	350° 25'.8	51'.7	240° 33'.0	58'.0
05	117° 37'.4	209° 59'.4	05'.9	314° 32'.7	53'.8	5° 28'.2	51'.7	255° 35'.2	58'.1
06	132° 39'.8	224° 59'.1	06'.0	329° 33'.9	53'.2	20° 30'.7	51'.7	270° 37'.3	58'.2
07	147° 42'.3	239° 58'.8	06'.1	344° 35'.0	52'.7	35° 33'.1	51'.7	285° 39'.5	58'.3
08	162° 44'.8	254° 58'.5	06'.2	359° 36'.1	52'.2	50° 35'.5	51'.7	300° 41'.7	58'.4
09	177° 47'.2	269° 58'.2	06'.3	14° 37'.2	51'.7	65° 38'.0	51'.7	315° 43'.8	58'.5
10	192° 49'.7	284° 57'.9	06'.4	29° 38'.3	51'.1	80° 40'.4	51'.7	330° 46'.0	58'.6
11	207° 52'.2	299° 57'.6	06'.4	44° 39'.4	50'.6	95° 42'.8	51'.7	345° 48'.2	58'.6
12	222° 54'.6	314° 57'.3	27° 06'.5 S	59° 40'.5	8° 50'.1 N	110° 45'.3	21° 51'.7 N	0° 50'.3	13° 58'.7 S
13	237° 57'.1	329° 57'.0	06'.6	74° 41'.6	49'.6	125° 47'.7	51'.7	15° 52'.5	58'.8
14	252° 59'.5	344° 56'.7	06'.7	89° 42'.7	49'.0	140° 50'.1	51'.7	30° 54'.7	58'.9
15	268° 02'.0	359° 56'.4	06'.8	104° 43'.8	48'.5	155° 52'.5	51'.7	45° 56'.8	59'.0
16	283° 04'.5	14° 56'.1	06'.8	119° 45'.0	48'.0	170° 55'.0	51'.7	60° 59'.0	59'.1
17	298° 06'.9	29° 55'.8	06'.9	134° 46'.1	47'.5	185° 57'.4	51'.7	76° 01'.2	59'.2
18	313° 09'.4	44° 55'.5	07'.0	149° 47'.2	46'.9	200° 59'.8	51'.7	91° 03'.4	59'.3
19	328° 11'.9	59° 55'.3	07'.1	164° 48'.3	46'.4	216° 02'.3	51'.7	106° 05'.5	59'.4
20	343° 14'.3	74° 55'.0	07'.1	179° 49'.4	45'.9	231° 04'.7	51'.7	121° 07'.7	59'.4
21	358° 16'.8	89° 54'.7	07'.2	194° 50'.5	45'.3	246° 07'.1	51'.7	136° 09'.9	59'.5
22	13° 19'.3	104° 54'.4	07'.3	209° 51'.6	44'.8	261° 09'.6	51'.7	151° 12'.0	59'.6
23	28° 21'.7	119° 54'.1	07'.3	224° 52'.7	44'.3	276° 12'.0	51'.7	166° 14'.2	59'.7
4 Monday 00	43° 24'.2	134° 53'.8	27° 07'.4 S	239° 53'.8	8° 43'.8 N	291° 14'.4	21° 51'.7 N	181° 16'.4	13° 59'.8 S
01	58° 26'.7	149° 53'.5	07'.5	254° 55'.0	43'.2	306° 16'.9	51'.7	196° 18'.5	59'.9
02	73° 29'.1	164° 53'.2	07'.5	269° 56'.1	42'.7	321° 19'.3	51'.7	211° 20'.7	14° 00'.0 S
03	88° 31'.6	179° 52'.9	07'.6	284° 57'.2	42'.2	336° 21'.8	51'.7	226° 22'.9	00'.1
04	103° 34'.0	194° 52'.7	07'.7	299° 58'.3	41'.7	351° 24'.2	51'.7	241° 25'.0	00'.2
05	118° 36'.5	209° 52'.4	07'.7	314° 59'.4	41'.1	6° 26'.6	51'.7	256° 27'.2	00'.3
06	133° 39'.0	224° 52'.1	07'.8	330° 00'.5	40'.6	21° 29'.1	51'.7	271° 29'.4	00'.3
07	148° 41'.4	239° 51'.8	07'.9	345° 01'.6	40'.1	36° 31'.5	51'.7	286° 31'.6	00'.4
08	163° 43'.9	254° 51'.5	07'.9	0° 02'.7	39'.6	51° 33'.9	51'.7	301° 33'.7	00'.5
09	178° 46'.4	269° 51'.2	08'.0	15° 03'.9	39'.0	66° 36'.4	51'.7	316° 35'.9	00'.6
10	193° 48'.8	284° 51'.0	08'.0	30° 05'.0	38'.5	81° 38'.8	51'.7	331° 38'.1	00'.7
11	208° 51'.3	299° 50'.7	08'.1	45° 06'.1	38'.0	96° 41'.2	51'.7	346° 40'.2	00'.8
12	223° 53'.8	314° 50'.4	27° 08'.1 S	60° 07'.2	8° 37'.5 N	111° 43'.7	21° 51'.7 N	1° 42'.4	14° 00'.9 S
13	238° 56'.2	329° 50'.1	08'.2	75° 08'.3	36'.9	126° 46'.1	51'.7	16° 44'.6	01'.0
14	253° 58'.7	344° 49'.8	08'.2	90° 09'.4	36'.4	141° 48'.6	51'.7	31° 46'.7	01'.1
15	269° 01'.2	359° 49'.6	08'.3	105° 10'.5	35'.9	156° 51'.0	51'.7	46° 48'.9	01'.2
16	284° 03'.6	14° 49'.3	08'.4	120° 11'.7	35'.3	171° 53'.4	51'.7	61° 51'.1	01'.2
17	299° 06'.1	29° 49'.0	08'.4	135° 12'.8	34'.8	186° 55'.9	51'.7	76° 53'.2	01'.3
18	314° 08'.5	44° 48'.7	08'.5	150° 13'.9	34'.3	201° 58'.3	51'.7	91° 55'.4	01'.4
19	329° 11'.0	59° 48'.5	08'.5	165° 15'.0	33'.8	217° 00'.8	51'.7	106° 57'.6	01'.5
20	344° 13'.5	74° 48'.2	08'.5	180° 16'.1	33'.2	232° 03'.2	51'.7	121° 59'.8	01'.6
21	359° 15'.9	89° 47'.9	08'.6	195° 17'.2	32'.7	247° 05'.7	51'.7	137° 01'.9	01'.7
22	14° 18'.4	104° 47'.6	08'.6	210° 18'.4	32'.2	262° 08'.1	51'.7	152° 04'.1	01'.8
23	29° 20'.9	119° 47'.4	08'.7	225° 19'.5	31'.7	277° 10'.5	51'.7	167° 06'.3	01'.9
5 Tuesday 00	44° 23'.3	134° 47'.1	27° 08'.7 S	240° 20'.6	8° 31'.1 N	292° 13'.0	21° 51'.7 N	182° 08'.4	14° 02'.0 S
01	59° 25'.8	149° 46'.8	08'.8	255° 21'.7	30'.6	307° 15'.4	51'.7	197° 10'.6	02'.0
02	74° 28'.3	164° 46'.6	08'.8	270° 22'.8	30'.1	322° 17'.9	51'.8	212° 12'.8	02'.1
03	89° 30'.7	179° 46'.3	08'.8	285° 23'.9	29'.6	337° 20'.3	51'.8	227° 14'.9	02'.2
04	104° 33'.2	194° 46'.0	08'.9	300° 25'.1	29'.0	352° 22'.8	51'.8	242° 17'.1	02'.3
05	119° 35'.6	209° 45'.8	08'.9	315° 26'.2	28'.5	7° 25'.2	51'.8	257° 19'.3	02'.4
06	134° 38'.1	224° 45'.5	09'.0	330° 27'.3	28'.0	22° 27'.7	51'.8	272° 21'.4	02'.5
07	149° 40'.6	239° 45'.2	09'.0	345° 28'.4	27'.5	37° 30'.1	51'.8	287° 23'.6	02'.6
08	164° 43'.0	254° 45'.0	09'.0	0° 29'.5	26'.9	52° 32'.5	51'.8	302° 25'.8	02'.7
09	179° 45'.5	269° 44'.7	09'.1	15° 30'.7	26'.4	67° 35'.0	51'.8	317° 27'.9	02'.8
10	194° 48'.0	284° 44'.5	09'.1	30° 31'.8	25'.9	82° 37'.4	51'.8	332° 30'.1	02'.9
11	209° 50'.4	299° 44'.2	09'.1	45° 32'.9	25'.3	97° 39'.9	51'.8	347° 32'.3	02'.9
12	224° 52'.9	314° 43'.9	27° 09'.2 S	60° 34'.0	8° 24'.8 N	112° 42'.3	21° 51'.8 N	2° 34'.5	14° 03'.0 S
13	239° 55'.4	329° 43'.7	09'.2	75° 35'.1	24'.3	127° 44'.8	51'.8	17° 36'.6	03'.1
14	254° 57'.8	344° 43'.4	09'.2	90° 36'.2	23'.8	142° 47'.2	51'.8	32° 38'.8	03'.2
15	270° 00'.3	359° 43'.2	09'.2	105° 37'.4	23'.2	157° 49'.7	51'.8	47° 41'.0	03'.3
16	285° 02'.8	14° 42'.9	09'.3	120° 38'.5	22'.7	172° 52'.1	51'.8	62° 43'.1	03'.4
17	300° 05'.2	29° 42'.6	09'.3	135° 39'.6	22'.2	187° 54'.6	51'.8	77° 45'.3	03'.5
18	315° 07'.7	44° 42'.4	09'.3	150° 40'.7	21'.7	202° 57'.0	51'.8	92° 47'.5	03'.6
19	330° 10'.1	59° 42'.1	09'.3	165° 41'.8	21'.1	217° 59'.5	51'.8	107° 49'.6	03'.7
20	345° 12'.6	74° 41'.9	09'.4	180° 43'.0	20'.6	233° 01'.9	51'.8	122° 51'.8	03'.7
21	0° 15'.1	89° 41'.6	09'.4	195° 44'.1	20'.1	248° 04'.4	51'.8	137° 54'.0	03'.8
22	15° 17'.5	104° 41'.4	09'.4	210° 45'.2	19'.6	263° 06'.8	51'.8	152° 56'.1	03'.9
23	30° 20'.0	119° 41'.1	09'.4	225° 46'.3	19'.0	278° 09'.3	51'.8	167° 58'.3	04'.0
	M.P. 21:03	v -0'.3	d 0'.1	v 1'.1	d 0'.5	v 2'.4	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.7	40° 15'.0 S
Achernar	335° 26'.1	57° 10'.0 S
Acrux	173° 09'.5	63° 10'.4 S
Adhara	255° 12'.1	28° 59'.4 S
Aldebaran	290° 48'.8	16° 32'.1 N
Alioth	166° 21'.0	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.7 N
Alnair	27° 43'.3	46° 53'.7 S
Alnilam	275° 45'.9	1° 11'.7 S
Alphard	217° 55'.9	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.3 N
Alpheratz	357° 42'.9	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.9	19° 06'.7 N
Atria	107° 28'.3	69° 03'.1 S
Avior	234° 17'.8	59° 33'.1 S
Bellatrix	278° 31'.5	6° 21'.6 N
Betelgeuse	271° 00'.8	7° 24'.5 N
Canopus	263° 55'.7	52° 42'.1 S
Capella	280° 33'.7	46° 00'.5 N
Deneb	49° 31'.3	45° 20'.3 N
Denebola	182° 33'.6	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.8	61° 40'.3 N
Elnath	278° 12'.0	28° 37'.0 N
Eltanin	90° 46'.4	51° 29'.6 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.5	29° 32'.9 S
Gacrux	172° 01'.0	57° 11'.3 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.7 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 21'.3	74° 06'.0 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.5	4° 08'.7 N
Menkent	148° 07'.6	36° 26'.1 S
Miaplacidus	221° 39'.6	69° 46'.2 S
Mirfak	308° 39'.4	49° 54'.5 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.0	56° 41'.5 S
Polaris	317° 10'.8	89° 19'.4 N
Pollux	243° 27'.3	27° 59'.3 N
Procyon	244° 59'.4	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.4	11° 53'.9 N
Rigel	281° 11'.5	8° 11'.2 S
Rigil Kent	139° 51'.9	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.0 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.3	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.0	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	91° 29'.6	15:01
Mars	196° 29'.7	08:00
Jupiter	247° 50'.3	04:34
Saturn	137° 52'.2	11:53

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP
184° 06'.6	15° 02'.4 S	191° 03'.2	8'.5	13° 06'.6 S	8'.8	58'.9
199° 06'.6	03'.2	205° 30'.7	8'.4	15'.4	8'.8	
214° 06'.6	04'.0	219° 58'.1	8'.3	24'.2	8'.7	
229° 06'.6	04'.8	234° 25'.4	8'.3	32'.9	8'.6	
244° 06'.6	05'.6	248° 52'.7	8'.2	41'.5	8'.5	59'.0
259° 06'.6	06'.3	263° 19'.9	8'.1	50'.0	8'.4	
274° 06'.6	07'.1	277° 47'.0	8'.0	58'.4	8'.4	
289° 06'.6	07'.9	292° 14'.0	8'.0	14° 06'.8 S	8'.3	
304° 06'.6	08'.7	306° 41'.0	7'.9	15'.1	8'.2	59'.1
319° 06'.6	09'.4	321° 07'.9	7'.8	23'.3	8'.1	
334° 06'.6	10'.2	335° 34'.7	7'.8	31'.4	8'.1	
349° 06'.6	11'.0	350° 01'.5	7'.6	39'.5	7'.9	
4° 06'.6	15° 11'.8 S	4° 28'.1	7'.6	14° 47'.4 S	7'.9	59'.2
19° 06'.6	12'.6	18° 54'.7	7'.6	55'.3	7'.8	
34° 06'.6	13'.3	33° 21'.3	7'.4	15° 03'.1 S	7'.7	
49° 06'.5	14'.1	47° 47'.7	7'.4	10'.8	7'.6	
64° 06'.5	14'.9	62° 14'.1	7'.3	18'.4	7'.5	59'.3
79° 06'.5	15'.7	76° 40'.4	7'.3	25'.9	7'.4	
94° 06'.5	16'.4	91° 06'.7	7'.1	33'.3	7'.3	
109° 06'.5	17'.2	105° 32'.8	7'.2	40'.6	7'.3	
124° 06'.5	18'.0	119° 59'.0	7'.0	47'.9	7'.1	
139° 06'.5	18'.7	134° 25'.0	7'.0	55'.0	7'.1	59'.4
154° 06'.5	19'.5	148° 51'.0	6'.9	16° 02'.1 S	6'.9	
169° 06'.5	20'.3	163° 16'.9	6'.8	09'.0	6'.9	
184° 06'.5	15° 21'.1 S	177° 42'.7	6'.8	16° 15'.9 S	6'.7	59'.4
199° 06'.5	21'.8	192° 08'.5	6'.7	22'.6	6'.6	
214° 06'.5	22'.6	206° 34'.2	6'.6	29'.2	6'.6	59'.5
229° 06'.5	23'.4	220° 59'.8	6'.6	35'.8	6'.4	
244° 06'.5	24'.1	235° 25'.4	6'.5	42'.2	6'.4	
259° 06'.4	24'.9	249° 50'.9	6'.4	48'.6	6'.2	
274° 06'.4	25'.7	264° 16'.3	6'.4	54'.8	6'.1	
289° 06'.4	26'.4	278° 41'.7	6'.3	17° 00'.9 S	6'.0	59'.6
304° 06'.4	27'.2	293° 07'.0	6'.3	06'.9	5'.9	
319° 06'.4	28'.0	307° 32'.3	6'.2	12'.8	5'.8	
334° 06'.4	28'.7	321° 57'.5	6'.1	18'.6	5'.7	
349° 06'.4	29'.5	336° 22'.6	6'.1	24'.3	5'.5	
4° 06'.4	15° 30'.3 S	350° 47'.7	6'.0	17° 29'.8 S	5'.5	59'.6
19° 06'.4	31'.0	5° 12'.7	6'.0	35'.3	5'.3	59'.7
34° 06'.3	31'.8	19° 37'.7	5'.9	40'.6	5'.2	
49° 06'.3	32'.6	34° 02'.6	5'.9	45'.8	5'.1	
64° 06'.3	33'.3	48° 27'.5	5'.8	50'.9	5'.0	
79° 06'.3	34'.1	62° 52'.3	5'.7	55'.9	4'.9	
94° 06'.3	34'.9	77° 17'.0	5'.7	18° 00'.8 S	4'.7	
109° 06'.3	35'.6	91° 41'.7	5'.7	05'.5	4'.7	59'.8
124° 06'.3	36'.4	106° 06'.4	5'.6	10'.2	4'.5	
139° 06'.2	37'.2	120° 31'.0	5'.6	14'.7	4'.4	
154° 06'.2	37'.9	134° 55'.6	5'.5	19'.1	4'.2	
169° 06'.2	38'.7	149° 20'.1	5'.4	23'.3	4'.1	
184° 06'.2	15° 39'.4 S	163° 44'.5	5'.5	18° 27'.4 S	4'.1	59'.8
199° 06'.2	40'.2	178° 09'.0	5'.3	31'.5	3'.8	
214° 06'.2	41'.0	192° 33'.3	5'.4	35'.3	3'.8	
229° 06'.1	41'.7	206° 57'.7	5'.3	39'.1	3'.6	59'.9
244° 06'.1	42'.5	221° 22'.0	5'.3	42'.7	3'.5	
259° 06'.1	43'.2	235° 46'.3	5'.2	46'.2	3'.4	
274° 06'.1	44'.0	250° 10'.5	5'.2	49'.6	3'.3	
289° 06'.1	44'.8	264° 34'.7	5'.1	52'.9	3'.1	
304° 06'.0	45'.5	278° 58'.8	5'.2	56'.0	3'.0	
319° 06'.0	46'.3	293° 23'.0	5'.1	59'.0	2'.8	
334° 06'.0	47'.0	307° 47'.1	5'.0	19° 01'.8 S	2'.7	
349° 06'.0	47'.8	322° 11'.1	5'.1	04'.5	2'.6	
4° 06'.0	15° 48'.5 S	336° 35'.2	5'.0	19° 07'.1 S	2'.5	59'.9
19° 05'.9	49'.3	350° 59'.2	5'.0	09'.6	2'.3	
34° 05'.9	50'.0	5° 23'.2	4'.9	11'.9	2'.2	60'.0
49° 05'.9	50'.8	19° 47'.1	5'.0	14'.1	2'.1	
64° 05'.9	51'.5	34° 11'.1	4'.9	16'.2	1'.9	
79° 05'.8	52'.3	48° 35'.0	4'.9	18'.1	1'.8	
94° 05'.8	53'.1	62° 58'.9	4'.8	19'.9	1'.6	
109° 05'.8	53'.8	77° 22'.7	4'.9	21'.5	1'.6	
124° 05'.8	54'.6	91° 46'.6	4'.9	23'.1	1'.3	
139° 05'.8	55'.3	106° 10'.5	4'.8	24'.4	1'.3	
154° 05'.7	56'.1	120° 34'.3	4'.8	25'.7	1'.1	
169° 05'.7	56'.8	134° 58'.1	4'.8	26'.8	1'.0	
SD 16'.1	d 0'.8	SD	16'.1	16'.3	16'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5
N 72°	06:18	07:43	09:17	09:08	11:49	-
N 70°	06:13	07:29	08:46	08:35	10:34	12:32
68°	06:08	07:16	08:24	08:12	09:57	11:32
66°	06:04	07:06	08:06	07:54	09:30	10:58
64°	06:01	06:58	07:52	07:39	09:10	10:33
62°	05:57	06:51	07:40	07:27	08:54	10:13
60°	05:54	06:44	07:30	07:17	08:40	09:57
N 58°	05:51	06:38	07:21	07:08	08:29	09:44
56°	05:49	06:33	07:14	07:00	08:18	09:32
54°	05:47	06:29	07:07	06:53	08:10	09:22
52°	05:44	06:24	07:00	06:47	08:02	09:13
50°	05:42	06:20	06:55	06:41	07:54	09:05
45°	05:37	06:12	06:43	06:29	07:39	08:47
N 40°	05:32	06:04	06:33	06:19	07:27	08:33
35°	05:27	05:58	06:24	06:10	07:16	08:21
30°	05:23	05:51	06:16	06:03	07:07	08:11
20°	05:14	05:40	06:03	05:50	06:51	07:53
N 10°	05:04	05:29	05:51	05:39	06:37	07:38
0°	04:54	05:19	05:40	05:28	06:25	07:23
S 10°	04:41	05:07	05:29	05:18	06:12	07:09
20°	04:27	04:54	05:17	05:07	05:58	06:54
30°	04:07	04:37	05:03	04:55	05:43	06:36
35°	03:55	04:28	04:55	04:47	05:34	06:26
40°	03:40	04:16	04:45	04:39	05:23	06:14
45°	03:22	04:02	04:34	04:30	05:12	06:01
S 50°	02:57	03:44	04:21	04:18	04:57	05:44
52°	02:45	03:36	04:15	04:13	04:50	05:36
54°	02:31	03:26	04:08	04:07	04:43	05:28
56°	02:14	03:16	04:00	04:01	04:35	05:18
58°	01:52	03:03	03:52	03:54	04:26	05:07
S 60°	01:23	02:48	03:42	03:46	04:15	04:54
S 62°	00:34	02:30	03:30	03:37	04:03	04:39

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 3	Moonset 4	Moonset 5
N 72°	14:09	15:42	17:07	14:00	13:18	-
N 70°	14:39	15:57	17:13	14:33	14:33	14:39
68°	15:02	16:09	17:17	14:58	15:11	15:39
66°	15:20	16:20	17:22	15:17	15:38	16:14
64°	15:34	16:28	17:25	15:32	15:59	16:39
62°	15:46	16:36	17:29	15:45	16:16	16:59
60°	15:56	16:42	17:32	15:56	16:30	17:15
N 58°	16:05	16:48	17:35	16:06	16:42	17:29
56°	16:13	16:53	17:37	16:14	16:52	17:41
54°	16:20	16:58	17:40	16:22	17:02	17:51
52°	16:26	17:02	17:42	16:29	17:10	18:00
50°	16:32	17:06	17:44	16:35	17:17	18:08
45°	16:44	17:15	17:50	16:48	17:33	18:26
N 40°	16:54	17:22	17:55	16:59	17:46	18:40
35°	17:03	17:29	17:59	17:08	17:57	18:52
30°	17:11	17:35	18:04	17:16	18:07	19:03
20°	17:24	17:47	18:13	17:31	18:24	19:21
N 10°	17:36	17:58	18:23	17:43	18:39	19:37
0°	17:47	18:09	18:33	17:55	18:52	19:52
S 10°	17:58	18:20	18:46	18:06	19:06	20:07
20°	18:11	18:34	19:01	18:19	19:21	20:23
30°	18:25	18:50	19:21	18:33	19:38	20:41
35°	18:33	19:00	19:33	18:42	19:47	20:51
40°	18:42	19:12	19:48	18:51	19:59	21:03
45°	18:54	19:26	20:07	19:02	20:12	21:18
S 50°	19:07	19:44	20:32	19:16	20:28	21:35
52°	19:13	19:53	20:44	19:22	20:35	21:43
54°	19:20	20:02	20:59	19:29	20:44	21:52
56°	19:28	20:13	21:16	19:37	20:53	22:03
58°	19:37	20:26	21:39	19:46	21:04	22:14
S 60°	19:47	20:42	22:09	19:56	21:16	22:28
S 62°	19:59	21:00	23:06	20:07	21:31	22:44

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
3	16 26	16 26	11:44	11:41	24:10	29d 0%
4	16 26	16 25	11:44	12:38	00:10	1d 1%
5	16 25	16 24	11:44	13:38	01:08	2d 5%

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2013 November 6, 7, 8 (Wed, Thur, Fri)

GMT		ARIES	VENUS -4.5		MARS +1.4		JUPITER -2.4		SATURN +0.5	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
6 Wednesday	00	45° 22'.5	134° 40'.9	27° 09'.4 S	240° 47'.5	8° 18'.5 N	293° 11'.7	21° 51'.8 N	183° 00'.5	14° 04'.1 S
	01	60° 24'.9	149° 40'.6	09'.5	255° 48'.6	18'.0	308° 14'.2	51'.8	198° 02'.6	04'.2
	02	75° 27'.4	164° 40'.4	09'.5	270° 49'.7	17'.5	323° 16'.6	51'.8	213° 04'.8	04'.3
	03	90° 29'.9	179° 40'.1	09'.5	285° 50'.8	16'.9	338° 19'.1	51'.8	228° 07'.0	04'.4
	04	105° 32'.3	194° 39'.9	09'.5	300° 51'.9	16'.4	353° 21'.6	51'.8	243° 09'.2	04'.5
	05	120° 34'.8	209° 39'.6	09'.5	315° 53'.1	15'.9	8° 24'.0	51'.8	258° 11'.3	04'.5
	06	135° 37'.3	224° 39'.4	09'.5	330° 54'.2	15'.3	23° 26'.5	51'.8	273° 13'.5	04'.6
	07	150° 39'.7	239° 39'.2	09'.5	345° 55'.3	14'.8	38° 28'.9	51'.8	288° 15'.7	04'.7
	08	165° 42'.2	254° 38'.9	09'.5	0° 56'.4	14'.3	53° 31'.4	51'.8	303° 17'.8	04'.8
	09	180° 44'.6	269° 38'.7	09'.6	15° 57'.6	13'.8	68° 33'.8	51'.9	318° 20'.0	04'.9
	10	195° 47'.1	284° 38'.4	09'.6	30° 58'.7	13'.2	83° 36'.3	51'.9	333° 22'.2	05'.0
	11	210° 49'.6	299° 38'.2	09'.6	45° 59'.8	12'.7	98° 38'.7	51'.9	348° 24'.3	05'.1
	12	225° 52'.0	314° 38'.0	27° 09'.6 S	61° 00'.9	8° 12'.2 N	113° 41'.2	21° 51'.9 N	3° 26'.5	14° 05'.2 S
	13	240° 54'.5	329° 37'.7	09'.6	76° 02'.0	11'.7	128° 43'.7	51'.9	18° 28'.7	05'.3
	14	255° 57'.0	344° 37'.5	09'.6	91° 03'.2	11'.1	143° 46'.1	51'.9	33° 30'.8	05'.3
	15	270° 59'.4	359° 37'.2	09'.6	106° 04'.3	10'.6	158° 48'.6	51'.9	48° 33'.0	05'.4
	16	286° 01'.9	14° 37'.0	09'.6	121° 05'.4	10'.1	173° 51'.0	51'.9	63° 35'.2	05'.5
	17	301° 04'.4	29° 36'.8	09'.6	136° 06'.5	09'.6	188° 53'.5	51'.9	78° 37'.3	05'.6
	18	316° 06'.8	44° 36'.5	09'.6	151° 07'.7	09'.0	203° 55'.9	51'.9	93° 39'.5	05'.7
	19	331° 09'.3	59° 36'.3	09'.6	166° 08'.8	08'.5	218° 58'.4	51'.9	108° 41'.7	05'.8
	20	346° 11'.8	74° 36'.1	09'.6	181° 09'.9	08'.0	234° 00'.9	51'.9	123° 43'.9	05'.9
	21	1° 14'.2	89° 35'.8	09'.6	196° 11'.0	07'.4	249° 03'.3	51'.9	138° 46'.0	06'.0
	22	16° 16'.7	104° 35'.6	09'.6	211° 12'.2	06'.9	264° 05'.8	51'.9	153° 48'.2	06'.1
	23	31° 19'.1	119° 35'.4	09'.6	226° 13'.3	06'.4	279° 08'.2	51'.9	168° 50'.4	06'.1
7 Thursday	00	46° 21'.6	134° 35'.1	27° 09'.6 S	241° 14'.4	8° 05'.9 N	294° 10'.7	21° 51'.9 N	183° 52'.5	14° 06'.2 S
	01	61° 24'.1	149° 34'.9	09'.5	256° 15'.5	05'.3	309° 13'.2	51'.9	198° 54'.7	06'.3
	02	76° 26'.5	164° 34'.7	09'.5	271° 16'.7	04'.8	324° 15'.6	51'.9	213° 56'.9	06'.4
	03	91° 29'.0	179° 34'.5	09'.5	286° 17'.8	04'.3	339° 18'.1	51'.9	228° 59'.0	06'.5
	04	106° 31'.5	194° 34'.2	09'.5	301° 18'.9	03'.8	354° 20'.6	51'.9	244° 01'.2	06'.6
	05	121° 33'.9	209° 34'.0	09'.5	316° 20'.1	03'.2	9° 23'.0	51'.9	259° 03'.4	06'.7
	06	136° 36'.4	224° 33'.8	09'.5	331° 21'.2	02'.7	24° 25'.5	52'.0	274° 05'.5	06'.8
	07	151° 38'.9	239° 33'.6	09'.5	346° 22'.3	02'.2	39° 27'.9	52'.0	289° 07'.7	06'.9
	08	166° 41'.3	254° 33'.4	09'.5	1° 23'.4	01'.7	54° 30'.4	52'.0	304° 09'.9	06'.9
	09	181° 43'.8	269° 33'.1	09'.5	16° 24'.6	01'.1	69° 32'.9	52'.0	319° 12'.0	07'.0
	10	196° 46'.3	284° 32'.9	09'.4	31° 25'.7	00'.6	84° 35'.3	52'.0	334° 14'.2	07'.1
	11	211° 48'.7	299° 32'.7	09'.4	46° 26'.8	00'.1	99° 37'.8	52'.0	349° 16'.4	07'.2
	12	226° 51'.2	314° 32'.5	27° 09'.4 S	61° 27'.9	7° 59'.6 N	114° 40'.3	21° 52'.0 N	4° 18'.6	14° 07'.3 S
	13	241° 53'.6	329° 32'.3	09'.4	76° 29'.1	59'.0	129° 42'.7	52'.0	19° 20'.7	07'.4
	14	256° 56'.1	344° 32'.0	09'.4	91° 30'.2	58'.5	144° 45'.2	52'.0	34° 22'.9	07'.5
	15	271° 58'.6	359° 31'.8	09'.3	106° 31'.3	58'.0	159° 47'.7	52'.0	49° 25'.1	07'.6
	16	287° 01'.0	14° 31'.6	09'.3	121° 32'.5	57'.4	174° 50'.1	52'.0	64° 27'.2	07'.7
	17	302° 03'.5	29° 31'.4	09'.3	136° 33'.6	56'.9	189° 52'.6	52'.0	79° 29'.4	07'.7
	18	317° 06'.0	44° 31'.2	09'.3	151° 34'.7	56'.4	204° 55'.1	52'.0	94° 31'.6	07'.8
	19	332° 08'.4	59° 31'.0	09'.2	166° 35'.8	55'.9	219° 57'.5	52'.0	109° 33'.7	07'.9
	20	347° 10'.9	74° 30'.8	09'.2	181° 37'.0	55'.3	235° 00'.0	52'.0	124° 35'.9	08'.0
	21	2° 13'.4	89° 30'.6	09'.2	196° 38'.1	54'.8	250° 02'.5	52'.0	139° 38'.1	08'.1
	22	17° 15'.8	104° 30'.4	09'.2	211° 39'.2	54'.3	265° 05'.0	52'.0	154° 40'.2	08'.2
	23	32° 18'.3	119° 30'.2	09'.1	226° 40'.4	53'.8	280° 07'.4	52'.0	169° 42'.4	08'.3
8 Friday	00	47° 20'.8	134° 29'.9	27° 09'.1 S	241° 41'.5	7° 53'.2 N	295° 09'.9	21° 52'.1 N	184° 44'.6	14° 08'.4 S
	01	62° 23'.2	149° 29'.7	09'.1	256° 42'.6	52'.7	310° 12'.4	52'.1	199° 46'.7	08'.5
	02	77° 25'.7	164° 29'.5	09'.0	271° 43'.8	52'.2	325° 14'.8	52'.1	214° 48'.9	08'.5
	03	92° 28'.1	179° 29'.3	09'.0	286° 44'.9	51'.7	340° 17'.3	52'.1	229° 51'.1	08'.6
	04	107° 30'.6	194° 29'.1	09'.0	301° 46'.0	51'.1	355° 19'.8	52'.1	244° 53'.3	08'.7
	05	122° 33'.1	209° 28'.9	08'.9	316° 47'.2	50'.6	10° 22'.2	52'.1	259° 55'.4	08'.8
	06	137° 35'.5	224° 28'.7	08'.9	331° 48'.3	50'.1	25° 24'.7	52'.1	274° 57'.6	08'.9
	07	152° 38'.0	239° 28'.5	08'.8	346° 49'.4	49'.6	40° 27'.2	52'.1	289° 59'.8	09'.0
	08	167° 40'.5	254° 28'.3	08'.8	1° 50'.6	49'.0	55° 29'.7	52'.1	305° 01'.9	09'.1
	09	182° 42'.9	269° 28'.1	08'.8	16° 51'.7	48'.5	70° 32'.1	52'.1	320° 04'.1	09'.2
	10	197° 45'.4	284° 27'.9	08'.7	31° 52'.8	48'.0	85° 34'.6	52'.1	335° 06'.3	09'.3
	11	212° 47'.9	299° 27'.7	08'.7	46° 53'.9	47'.4	100° 37'.1	52'.1	350° 08'.4	09'.3
	12	227° 50'.3	314° 27'.6	27° 08'.6 S	61° 55'.1	7° 46'.9 N	115° 39'.6	21° 52'.1 N	5° 10'.6	14° 09'.4 S
	13	242° 52'.8	329° 27'.4	08'.6	76° 56'.2	46'.4	130° 42'.0	52'.1	20° 12'.8	09'.5
	14	257° 55'.2	344° 27'.2	08'.6	91° 57'.3	45'.9	145° 44'.5	52'.1	35° 14'.9	09'.6
	15	272° 57'.7	359° 27'.0	08'.5	106° 58'.5	45'.3	160° 47'.0	52'.2	50° 17'.1	09'.7
	16	288° 00'.2	14° 26'.8	08'.5	121° 59'.6	44'.8	175° 49'.5	52'.2	65° 19'.3	09'.8
	17	303° 02'.6	29° 26'.6	08'.4	137° 00'.7	44'.3	190° 51'.9	52'.2	80° 21'.4	09'.9
	18	318° 05'.1	44° 26'.4	08'.4	152° 01'.9	43'.8	205° 54'.4	52'.2	95° 23'.6	10'.0
	19	333° 07'.6	59° 26'.2	08'.3	167° 03'.0	43'.2	220° 56'.9	52'.2	110° 25'.8	10'.0
	20	348° 10'.0	74° 26'.0	08'.3	182° 04'.1	42'.7	235° 59'.4	52'.2	125° 28'.0	10'.1
	21	3° 12'.5	89° 25'.9	08'.2	197° 05'.3	42'.2	251° 01'.9	52'.2	140° 30'.1	10'.2
	22	18° 15'.0	104° 25'.7	08'.2	212° 06'.4	41'.7	266° 04'.3	52'.2	155° 32'.3	10'.3
	23	33° 17'.4	119° 25'.5	08'.1	227° 07'.6	41'.1	281° 06'.8	52'.2	170° 34'.5	10'.4
		M.P. 20:51	v -0'.2	d 0'.0	v 1'.1	d 0'.5	v 2'.5	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.7	40° 15'.0 S
Achernar	335° 26'.1	57° 10'.1 S
Acrux	173° 09'.5	63° 10'.3 S
Adhara	255° 12'.1	28° 59'.4 S
Aldebaran	290° 48'.8	16° 32'.1 N
Alioth	166° 21'.0	55° 53'.0 N
Alkaid	152° 59'.2	49° 14'.6 N
Alnair	27° 43'.3	46° 53'.7 S
Alnilam	275° 45'.8	1° 11'.7 S
Alphard	217° 55'.9	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.3 N
Alpheratz	357° 42'.9	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.7 N
Atria	107° 28'.3	69° 03'.1 S
Avior	234° 17'.7	59° 33'.1 S
Bellatrix	278° 31'.4	6° 21'.6 N
Betelgeuse	271° 00'.8	7° 24'.5 N
Canopus	263° 55'.7	52° 42'.1 S
Capella	280° 33'.6	46° 00'.5 N
Deneb	49° 31'.3	45° 20'.3 N
Denebola	182° 33'.6	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.8	61° 40'.3 N
Elnath	278° 12'.0	28° 37'.0 N
Eltanin	90° 46'.4	51° 29'.6 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.6	29° 32'.9 S
Gacrux	172° 01'.0	57° 11'.2 S
Gienah	175° 52'.3	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 21'.4	74° 06'.0 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.1 S
Miaplacidus	221° 39'.5	69° 46'.2 S
Mirfak	308° 39'.4	49° 54'.6 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.0	56° 41'.5 S
Polaris	317° 10'.4	89° 19'.4 N
Pollux	243° 27'.3	27° 59'.3 N
Procyon	244° 59'.3	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.3	11° 53'.9 N
Rigel	281° 11'.5	8° 11'.2 S
Rigil Kent	139° 51'.9	60° 53'.4 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.0 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.3	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.0	38° 48'.2 N
Zuben'ubi	137° 05'.5	16° 05'.8 S

	SHA	Mer.Pass.
Venus	88° 13'.5	15:02
Mars	194° 52'.8	07:54
Jupiter	247° 49'.1	04:23
Saturn	137° 30'.9	11:43

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
6 Wednesday 00	184° 05'.7	15° 57'.6 S	149° 21'.9	4'.8	19° 27'.8 S	0'.8	60'.0
01	199° 05'.7	58'.3	163° 45'.7	4'.8	28'.6	0'.7	
02	214° 05'.6	59'.1	178° 09'.5	4'.8	29'.3	0'.6	
03	229° 05'.6	59'.8	192° 33'.3	4'.8	29'.9	0'.4	
04	244° 05'.6	16° 00'.6 S	206° 57'.1	4'.8	30'.3	0'.3	
05	259° 05'.5	01'.3	221° 20'.9	4'.8	30'.6	0'.2	
06	274° 05'.5	02'.0	235° 44'.7	4'.7	30'.8	0'.0	
07	289° 05'.5	02'.8	250° 08'.4	4'.8	30'.8	0'.1	
08	304° 05'.5	03'.5	264° 32'.2	4'.8	30'.7	0'.3	
09	319° 05'.4	04'.3	278° 56'.0	4'.8	30'.4	0'.4	
10	334° 05'.4	05'.0	293° 19'.8	4'.8	30'.0	0'.5	
11	349° 05'.4	05'.8	307° 43'.6	4'.8	29'.5	0'.7	
12	4° 05'.3	16° 06'.5 S	322° 07'.4	4'.8	19° 28'.8 S	0'.8	60'.0
13	19° 05'.3	07'.3	336° 31'.2	4'.9	28'.0	0'.9	
14	34° 05'.3	08'.0	350° 55'.1	4'.8	27'.1	1'.1	
15	49° 05'.3	08'.8	5° 18'.9	4'.9	26'.0	1'.2	
16	64° 05'.2	09'.5	19° 42'.8	4'.8	24'.8	1'.4	
17	79° 05'.2	10'.2	34° 06'.6	4'.9	23'.4	1'.4	
18	94° 05'.2	11'.0	48° 30'.5	4'.9	22'.0	1'.7	
19	109° 05'.1	11'.7	62° 54'.4	5'.0	20'.3	1'.7	
20	124° 05'.1	12'.5	77° 18'.4	4'.9	18'.6	1'.9	
21	139° 05'.1	13'.2	91° 42'.3	5'.0	16'.7	2'.0	
22	154° 05'.0	13'.9	106° 06'.3	5'.0	14'.7	2'.2	
23	169° 05'.0	14'.7	120° 30'.3	5'.0	12'.5	2'.3	
7 Thursday 00	184° 05'.0	16° 15'.4 S	134° 54'.3	5'.1	19° 10'.2 S	2'.4	60'.0
01	199° 04'.9	16'.2	149° 18'.4	5'.1	07'.8	2'.5	
02	214° 04'.9	16'.9	163° 42'.5	5'.1	05'.3	2'.7	
03	229° 04'.9	17'.6	178° 06'.6	5'.1	02'.6	2'.8	
04	244° 04'.8	18'.4	192° 30'.7	5'.2	18° 59'.8 S	3'.0	
05	259° 04'.8	19'.1	206° 54'.9	5'.2	56'.8	3'.0	
06	274° 04'.8	19'.8	221° 19'.1	5'.2	53'.8	3'.2	59'.9
07	289° 04'.7	20'.6	235° 43'.3	5'.3	50'.6	3'.4	
08	304° 04'.7	21'.3	250° 07'.6	5'.3	47'.2	3'.4	
09	319° 04'.6	22'.0	264° 31'.9	5'.4	43'.8	3'.6	
10	334° 04'.6	22'.8	278° 56'.3	5'.4	40'.2	3'.7	
11	349° 04'.6	23'.5	293° 20'.7	5'.4	36'.5	3'.9	
12	4° 04'.5	16° 24'.2 S	307° 45'.1	5'.5	18° 32'.6 S	3'.9	59'.9
13	19° 04'.5	25'.0	322° 09'.6	5'.5	28'.7	4'.1	
14	34° 04'.5	25'.7	336° 34'.1	5'.6	24'.6	4'.3	
15	49° 04'.4	26'.4	350° 58'.7	5'.6	20'.3	4'.3	
16	64° 04'.4	27'.2	5° 23'.3	5'.7	16'.0	4'.5	
17	79° 04'.3	27'.9	19° 48'.0	5'.7	11'.5	4'.5	
18	94° 04'.3	28'.6	34° 12'.7	5'.7	07'.0	4'.7	59'.8
19	109° 04'.3	29'.4	48° 37'.4	5'.8	02'.3	4'.9	
20	124° 04'.2	30'.1	63° 02'.2	5'.9	17° 57'.4 S	4'.9	
21	139° 04'.2	30'.8	77° 27'.1	5'.9	52'.5	5'.1	
22	154° 04'.1	31'.5	91° 52'.0	5'.9	47'.4	5'.1	
23	169° 04'.1	32'.3	106° 16'.9	6'.0	42'.3	5'.3	
8 Friday 00	184° 04'.0	16° 33'.0 S	120° 41'.9	6'.1	17° 37'.0 S	5'.4	59'.8
01	199° 04'.0	33'.7	135° 07'.0	6'.1	31'.6	5'.5	
02	214° 04'.0	34'.4	149° 32'.1	6'.2	26'.1	5'.7	
03	229° 03'.9	35'.2	163° 57'.3	6'.2	20'.4	5'.7	
04	244° 03'.9	35'.9	178° 22'.5	6'.3	14'.7	5'.9	59'.7
05	259° 03'.8	36'.6	192° 47'.8	6'.3	08'.8	5'.9	
06	274° 03'.8	37'.3	207° 13'.1	6'.4	02'.9	6'.1	
07	289° 03'.7	38'.1	221° 38'.5	6'.5	16° 56'.8 S	6'.2	
08	304° 03'.7	38'.8	236° 04'.0	6'.5	50'.6	6'.3	
09	319° 03'.6	39'.5	250° 29'.5	6'.6	44'.3	6'.4	
10	334° 03'.6	40'.2	264° 55'.1	6'.6	37'.9	6'.5	
11	349° 03'.6	41'.0	279° 20'.7	6'.7	31'.4	6'.6	59'.6
12	4° 03'.5	16° 41'.7 S	293° 46'.4	6'.8	16° 24'.8 S	6'.7	59'.6
13	19° 03'.5	42'.4	308° 12'.2	6'.8	18'.1	6'.8	
14	34° 03'.4	43'.1	322° 38'.0	6'.9	11'.3	6'.9	
15	49° 03'.4	43'.8	337° 03'.9	6'.9	04'.4	7'.1	
16	64° 03'.3	44'.6	351° 29'.8	7'.0	15° 57'.3 S	7'.1	
17	79° 03'.3	45'.3	5° 55'.8	7'.1	50'.2	7'.2	
18	94° 03'.2	46'.0	20° 21'.9	7'.1	43'.0	7'.3	59'.5
19	109° 03'.2	46'.7	34° 48'.0	7'.2	35'.7	7'.4	
20	124° 03'.1	47'.4	49° 14'.2	7'.2	28'.3	7'.5	
21	139° 03'.1	48'.2	63° 40'.4	7'.4	20'.8	7'.6	
22	154° 03'.0	48'.9	78° 06'.8	7'.3	13'.2	7'.6	
23	169° 03'.0	49'.6	92° 33'.1	7'.5	05'.6	7'.8	
	SD 16'.1	d 0'.7	SD 16'.4		16'.3	16'.2	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8
N 72°	06:30	07:57	09:39	-	-	14:47
N 70°	06:23	07:40	09:02	13:49	14:03	14:04
68°	06:17	07:27	08:37	12:41	13:18	13:35
66°	06:13	07:16	08:18	12:05	12:48	13:14
64°	06:08	07:06	08:02	11:39	12:26	12:56
62°	06:04	06:58	07:49	11:19	12:08	12:42
60°	06:01	06:51	07:38	11:02	11:53	12:30
N 58°	05:57	06:45	07:28	10:48	11:40	12:19
56°	05:54	06:39	07:20	10:36	11:29	12:10
54°	05:52	06:34	07:12	10:26	11:19	12:02
52°	05:49	06:29	07:06	10:16	11:10	11:55
50°	05:46	06:25	07:00	10:08	11:02	11:48
45°	05:41	06:16	06:47	09:50	10:46	11:34
N 40°	05:35	06:07	06:36	09:36	10:32	11:22
35°	05:30	06:00	06:27	09:24	10:21	11:12
30°	05:25	05:54	06:19	09:13	10:10	11:03
20°	05:15	05:42	06:04	08:54	09:53	10:48
N 10°	05:05	05:30	05:52	08:38	09:38	10:34
0°	04:54	05:19	05:40	08:23	09:23	10:22
S 10°	04:41	05:06	05:28	08:09	09:09	10:09
20°	04:25	04:52	05:15	07:53	08:54	09:56
30°	04:05	04:35	05:01	07:34	08:37	09:41
35°	03:52	04:25	04:52	07:24	08:26	09:32
40°	03:36	04:12	04:42	07:12	08:15	09:21
45°	03:17	03:58	04:30	06:57	08:01	09:09
S 50°	02:51	03:39	04:16	06:40	07:44	08:55
52°	02:38	03:30	04:10	06:32	07:36	08:48
54°	02:22	03:20	04:02	06:22	07:28	08:40
56°	02:03	03:08	03:54	06:12	07:18	08:32
58°	01:39	02:54	03:45	06:00	07:07	08:22
S 60°	01:04	02:38	03:34	05:47	06:54	08:11
S 62°	-	02:18	03:21	05:31	06:38	07:59

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 6	Moonset 7	Moonset 8
N 72°	13:47	15:29	16:56	-	-	18:38
N 70°	14:24	15:46	17:03	15:29	17:19	19:19
68°	14:49	15:59	17:09	16:36	18:04	19:47
66°	15:09	16:11	17:14	17:12	18:34	20:08
64°	15:25	16:20	17:18	17:38	18:56	20:24
62°	15:38	16:28	17:22	17:58	19:13	20:38
60°	15:49	16:35	17:26	18:15	19:28	20:50
N 58°	15:58	16:42	17:29	18:29	19:40	21:00
56°	16:07	16:47	17:32	18:41	19:51	21:08
54°	16:14	16:53	17:35	18:51	20:01	21:16
52°	16:21	16:57	17:38	19:00	20:09	21:23
50°	16:27	17:02	17:40	19:09	20:17	21:29
45°	16:40	17:11	17:46	19:26	20:33	21:43
N 40°	16:51	17:19	17:52	19:41	20:46	21:54
35°	17:00	17:27	17:57	19:53	20:57	22:03
30°	17:08	17:33	18:02	20:03	21:07	22:11
20°	17:23	17:46	18:12	20:22	21:23	22:25
N 10°	17:35	17:57	18:22	20:37	21:38	22:37
0°	17:47	18:09	18:34	20:52	21:52	22:49
S 10°	17:59	18:21	18:47	21:07	22:05	23:00
20°	18:12	18:35	19:03	21:23	22:19	23:12
30°	18:27	18:53	19:23	21:41	22:36	23:26
35°	18:36	19:03	19:36	21:51	22:45	23:34
40°	18:46	19:16	19:52	22:03	22:56	23:42
45°	18:58	19:31	20:12	22:17	23:09	23:53
S 50°	19:12	19:50	20:38	22:34	23:24	24:05
52°	19:19	19:59	20:52	22:42	23:31	24:11
54°	19:26	20:09	21:08	22:51	23:39	24:18
56°	19:35	20:21	21:27	23:01	23:48	24:25
58°	19:44	20:35	21:52	23:12	23:58	24:33
S 60°	19:55	20:52	22:29	23:26	-	00:09
S 62°	20:08	21:12	-	23:41	-	00:23

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
6	16 23	16 21	11:44	14:38	02:08	3d 12%
7	16 20	16 18	11:44	15:38	03:08	4d 20%
8	16 16	16 14	11:44	16:35	04:07	5d 31%

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2013 November 9, 10, 11 (Sat, Sun, Mon)

GMT	ARIES	VENUS -4.5		MARS +1.4		JUPITER -2.5		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
9 Saturday 00	48° 19'.9	134° 25'.3	27° 08'.0 S	242° 08'.7	7° 40'.6 N	296° 09'.3	21° 52'.2 N	185° 36'.6	14° 10'.5 S
01	63° 22'.4	149° 25'.1	08'.0	257° 09'.8	40'.1	311° 11'.8	52'.2	200° 38'.8	10'.6
02	78° 24'.8	164° 24'.9	07'.9	272° 11'.0	39'.6	326° 14'.2	52'.2	215° 41'.0	10'.7
03	93° 27'.3	179° 24'.8	07'.9	287° 12'.1	39'.0	341° 16'.7	52'.2	230° 43'.1	10'.8
04	108° 29'.7	194° 24'.6	07'.8	302° 13'.2	38'.5	356° 19'.2	52'.2	245° 45'.3	10'.8
05	123° 32'.2	209° 24'.4	07'.8	317° 14'.4	38'.0	11° 21'.7	52'.3	260° 47'.5	10'.9
06	138° 34'.7	224° 24'.2	07'.7	332° 15'.5	37'.5	26° 24'.2	52'.3	275° 49'.6	11'.0
07	153° 37'.1	239° 24'.1	07'.6	347° 16'.6	36'.9	41° 26'.7	52'.3	290° 51'.8	11'.1
08	168° 39'.6	254° 23'.9	07'.6	2° 17'.8	36'.4	56° 29'.1	52'.3	305° 54'.0	11'.2
09	183° 42'.1	269° 23'.7	07'.5	17° 18'.9	35'.9	71° 31'.6	52'.3	320° 56'.1	11'.3
10	198° 44'.5	284° 23'.6	07'.4	32° 20'.1	35'.3	86° 34'.1	52'.3	335° 58'.3	11'.4
11	213° 47'.0	299° 23'.4	07'.4	47° 21'.2	34'.8	101° 36'.6	52'.3	351° 00'.5	11'.5
12	228° 49'.5	314° 23'.2	27° 07'.3 S	62° 22'.3	7° 34'.3 N	116° 39'.1	21° 52'.3 N	6° 02'.6	14° 11'.5 S
13	243° 51'.9	329° 23'.0	07'.2	77° 23'.5	33'.8	131° 41'.5	52'.3	21° 04'.8	11'.6
14	258° 54'.4	344° 22'.9	07'.2	92° 24'.6	33'.2	146° 44'.0	52'.3	36° 07'.0	11'.7
15	273° 56'.9	359° 22'.7	07'.1	107° 25'.7	32'.7	161° 46'.5	52'.3	51° 09'.2	11'.8
16	288° 59'.3	14° 22'.6	07'.0	122° 26'.9	32'.2	176° 49'.0	52'.3	66° 11'.3	11'.9
17	304° 01'.8	29° 22'.4	07'.0	137° 28'.0	31'.7	191° 51'.5	52'.4	81° 13'.5	12'.0
18	319° 04'.2	44° 22'.2	06'.9	152° 29'.2	31'.1	206° 54'.0	52'.4	96° 15'.7	12'.1
19	334° 06'.7	59° 22'.1	06'.8	167° 30'.3	30'.6	221° 56'.5	52'.4	111° 17'.8	12'.2
20	349° 09'.2	74° 21'.9	06'.7	182° 31'.4	30'.1	236° 58'.9	52'.4	126° 20'.0	12'.3
21	4° 11'.6	89° 21'.7	06'.7	197° 32'.6	29'.6	252° 01'.4	52'.4	141° 22'.2	12'.3
22	19° 14'.1	104° 21'.6	06'.6	212° 33'.7	29'.0	267° 03'.9	52'.4	156° 24'.3	12'.4
23	34° 16'.6	119° 21'.4	06'.5	227° 34'.8	28'.5	282° 06'.4	52'.4	171° 26'.5	12'.5
10 Sunday 00	49° 19'.0	134° 21'.3	27° 06'.4 S	242° 36'.0	7° 28'.0 N	297° 08'.9	21° 52'.4 N	186° 28'.7	14° 12'.6 S
01	64° 21'.5	149° 21'.1	06'.4	257° 37'.1	27'.5	312° 11'.4	52'.4	201° 30'.8	12'.7
02	79° 24'.0	164° 21'.0	06'.3	272° 38'.3	26'.9	327° 13'.9	52'.4	216° 33'.0	12'.8
03	94° 26'.4	179° 20'.8	06'.2	287° 39'.4	26'.4	342° 16'.4	52'.4	231° 35'.2	12'.9
04	109° 28'.9	194° 20'.7	06'.1	302° 40'.5	25'.9	357° 18'.9	52'.4	246° 37'.3	13'.0
05	124° 31'.3	209° 20'.5	06'.0	317° 41'.7	25'.4	12° 21'.3	52'.5	261° 39'.5	13'.0
06	139° 33'.8	224° 20'.4	05'.9	332° 42'.8	24'.8	27° 23'.8	52'.5	276° 41'.7	13'.1
07	154° 36'.3	239° 20'.2	05'.9	347° 44'.0	24'.3	42° 26'.3	52'.5	291° 43'.9	13'.2
08	169° 38'.7	254° 20'.1	05'.8	2° 45'.1	23'.8	57° 28'.8	52'.5	306° 46'.0	13'.3
09	184° 41'.2	269° 19'.9	05'.7	17° 46'.3	23'.3	72° 31'.3	52'.5	321° 48'.2	13'.4
10	199° 43'.7	284° 19'.8	05'.6	32° 47'.4	22'.7	87° 33'.8	52'.5	336° 50'.4	13'.5
11	214° 46'.1	299° 19'.6	05'.5	47° 48'.5	22'.2	102° 36'.3	52'.5	351° 52'.5	13'.6
12	229° 48'.6	314° 19'.5	27° 05'.4 S	62° 49'.7	7° 21'.7 N	117° 38'.8	21° 52'.5 N	6° 54'.7	14° 13'.7 S
13	244° 51'.1	329° 19'.3	05'.3	77° 50'.8	21'.1	132° 41'.3	52'.5	21° 56'.9	13'.7
14	259° 53'.5	344° 19'.2	05'.2	92° 52'.0	20'.6	147° 43'.8	52'.5	36° 59'.0	13'.8
15	274° 56'.0	359° 19'.1	05'.1	107° 53'.1	20'.1	162° 46'.3	52'.6	52° 01'.2	13'.9
16	289° 58'.5	14° 18'.9	05'.0	122° 54'.2	19'.6	177° 48'.8	52'.6	67° 03'.4	14'.0
17	305° 00'.9	29° 18'.8	04'.9	137° 55'.4	19'.0	192° 51'.2	52'.6	82° 05'.5	14'.1
18	320° 03'.4	44° 18'.7	04'.8	152° 56'.5	18'.5	207° 53'.7	52'.6	97° 07'.7	14'.2
19	335° 05'.8	59° 18'.5	04'.7	167° 57'.7	18'.0	222° 56'.2	52'.6	112° 09'.9	14'.3
20	350° 08'.3	74° 18'.4	04'.7	182° 58'.8	17'.5	237° 58'.7	52'.6	127° 12'.0	14'.4
21	5° 10'.8	89° 18'.3	04'.6	198° 00'.0	16'.9	253° 01'.2	52'.6	142° 14'.2	14'.4
22	20° 13'.2	104° 18'.1	04'.5	213° 01'.1	16'.4	268° 03'.7	52'.6	157° 16'.4	14'.5
23	35° 15'.7	119° 18'.0	04'.3	228° 02'.3	15'.9	283° 06'.2	52'.6	172° 18'.6	14'.6
11 Monday 00	50° 18'.2	134° 17'.9	27° 04'.2 S	243° 03'.4	7° 15'.4 N	298° 08'.7	21° 52'.6 N	187° 20'.7	14° 14'.7 S
01	65° 20'.6	149° 17'.7	04'.1	258° 04'.5	14'.8	313° 11'.2	52'.7	202° 22'.9	14'.8
02	80° 23'.1	164° 17'.6	04'.0	273° 05'.7	14'.3	328° 13'.7	52'.7	217° 25'.1	14'.9
03	95° 25'.6	179° 17'.5	03'.9	288° 06'.8	13'.8	343° 16'.2	52'.7	232° 27'.2	15'.0
04	110° 28'.0	194° 17'.4	03'.8	303° 08'.0	13'.3	358° 18'.7	52'.7	247° 29'.4	15'.1
05	125° 30'.5	209° 17'.2	03'.7	318° 09'.1	12'.7	13° 21'.2	52'.7	262° 31'.6	15'.2
06	140° 33'.0	224° 17'.1	03'.6	333° 10'.3	12'.2	28° 23'.7	52'.7	277° 33'.7	15'.2
07	155° 35'.4	239° 17'.0	03'.5	348° 11'.4	11'.7	43° 26'.2	52'.7	292° 35'.9	15'.3
08	170° 37'.9	254° 16'.9	03'.4	3° 12'.6	11'.2	58° 28'.7	52'.7	307° 38'.1	15'.4
09	185° 40'.3	269° 16'.8	03'.3	18° 13'.7	10'.6	73° 31'.2	52'.7	322° 40'.2	15'.5
10	200° 42'.8	284° 16'.7	03'.2	33° 14'.8	10'.1	88° 33'.7	52'.7	337° 42'.4	15'.6
11	215° 45'.3	299° 16'.5	03'.1	48° 16'.0	09'.6	103° 36'.2	52'.8	352° 44'.6	15'.7
12	230° 47'.7	314° 16'.4	27° 02'.9 S	63° 17'.1	7° 09'.1 N	118° 38'.7	21° 52'.8 N	7° 46'.7	14° 15'.8 S
13	245° 50'.2	329° 16'.3	02'.8	78° 18'.3	08'.5	133° 41'.2	52'.8	22° 48'.9	15'.8
14	260° 52'.7	344° 16'.2	02'.7	93° 19'.4	08'.0	148° 43'.7	52'.8	37° 51'.1	15'.9
15	275° 55'.1	359° 16'.1	02'.6	108° 20'.6	07'.5	163° 46'.2	52'.8	52° 53'.3	16'.0
16	290° 57'.6	14° 16'.0	02'.5	123° 21'.7	07'.0	178° 48'.7	52'.8	67° 55'.4	16'.1
17	306° 00'.1	29° 15'.9	02'.4	138° 22'.9	06'.4	193° 51'.2	52'.8	82° 57'.6	16'.2
18	321° 02'.5	44° 15'.8	02'.2	153° 24'.0	05'.9	208° 53'.7	52'.8	97° 59'.8	16'.3
19	336° 05'.0	59° 15'.7	02'.1	168° 25'.2	05'.4	223° 56'.2	52'.8	113° 01'.9	16'.4
20	351° 07'.4	74° 15'.5	02'.0	183° 26'.3	04'.9	238° 58'.7	52'.9	128° 04'.1	16'.5
21	6° 09'.9	89° 15'.4	01'.9	198° 27'.5	04'.3	254° 01'.2	52'.9	143° 06'.3	16'.5
22	21° 12'.4	104° 15'.3	01'.8	213° 28'.6	03'.8	269° 03'.7	52'.9	158° 08'.4	16'.6
23	36° 14'.8	119° 15'.2	01'.6	228° 29'.8	03'.3	284° 06'.2	52'.9	173° 10'.6	16'.7
	M.P. 20:39	v -0'.1	d 0'.1	v 1'.1	d 0'.5	v 2'.5	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.7	40° 15'.0 S
Achernar	335° 26'.1	57° 10'.1 S
Acrux	173° 09'.4	63° 10'.3 S
Adhara	255° 12'.1	28° 59'.4 S
Aldebaran	290° 48'.7	16° 32'.1 N
Alioth	166° 21'.0	55° 52'.9 N
Alkaid	152° 59'.2	49° 14'.6 N
Alnair	27° 43'.3	46° 53'.7 S
Alnilam	275° 45'.8	1° 11'.7 S
Alphard	217° 55'.8	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.3 N
Alpheratz	357° 42'.9	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.7 N
Atria	107° 28'.3	69° 03'.1 S
Avior	234° 17'.7	59° 33'.1 S
Bellatrix	278° 31'.4	6° 21'.6 N
Betelgeuse	271° 00'.7	7° 24'.5 N
Canopus	263° 55'.6	52° 42'.1 S
Capella	280° 33'.6	46° 00'.5 N
Deneb	49° 31'.3	45° 20'.3 N
Denebola	182° 33'.6	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.8	61° 40'.2 N
Elnath	278° 11'.9	28° 37'.0 N
Eltanin	90° 46'.4	51° 29'.6 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.6	29° 32'.9 S
Gacrux	172° 01'.0	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.0 S
Hadar	148° 48'.1	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 21'.4	74° 05'.9 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.1 S
Miaplacidus	221° 39'.5	69° 46'.2 S
Mirfak	308° 39'.4	49° 54'.6 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.0	56° 41'.5 S
Polaris	317° 10'.3	89° 19'.4 N
Pollux	243° 27'.3	27° 59'.3 N
Procyon	244° 59'.3	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.3	11° 53'.8 N
Rigel	281° 11'.5	8° 11'.2 S
Rigil Kent	139° 51'.9	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.3	16° 44'.1 S
Spica	158° 31'.3	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.1	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	85° 02'.2	15:03
Mars	193° 17'.0	07:49
Jupiter	247° 49'.9	04:11
Saturn	137° 09'.6	11:32

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
184° 02'.9	16° 50'.3 S	106° 59'.6	7'.5	14° 57'.8 S	7'.9	59'.5
199° 02'.9	51'.0	121° 26'.1	7'.6	49'.9	7'.9	59'.4
214° 02'.8	51'.7	135° 52'.7	7'.6	42'.0	8'.1	
229° 02'.8	52'.4	150° 19'.3	7'.7	33'.9	8'.1	
244° 02'.7	53'.2	164° 46'.0	7'.8	25'.8	8'.2	
259° 02'.7	53'.9	179° 12'.8	7'.9	17'.6	8'.3	
274° 02'.6	54'.6	193° 39'.7	7'.9	09'.3	8'.3	
289° 02'.6	55'.3	208° 06'.6	7'.9	01'.0	8'.5	59'.3
304° 02'.5	56'.0	222° 33'.5	8'.1	13° 52'.5 S	8'.5	
319° 02'.4	56'.7	237° 00'.6	8'.0	44'.0	8'.6	
334° 02'.4	57'.4	251° 27'.6	8'.2	35'.4	8'.7	
349° 02'.3	58'.1	265° 54'.8	8'.2	26'.7	8'.8	
4° 02'.3	16° 58'.8 S	280° 22'.0	8'.3	13° 17'.9 S	8'.8	59'.3
19° 02'.2	59'.6	294° 49'.3	8'.4	09'.1	8'.9	59'.2
34° 02'.2	17° 00'.3 S	309° 16'.7	8'.4	00'.2	9'.0	
49° 02'.1	01'.0	323° 44'.1	8'.5	12° 51'.2 S	9'.1	
64° 02'.1	01'.7	338° 11'.6	8'.5	42'.1	9'.1	
79° 02'.0	02'.4	352° 39'.1	8'.6	33'.0	9'.2	
94° 01'.9	03'.1	7° 06'.7	8'.7	23'.8	9'.3	59'.1
109° 01'.9	03'.8	21° 34'.4	8'.7	14'.5	9'.3	
124° 01'.8	04'.5	36° 02'.1	8'.8	05'.2	9'.4	
139° 01'.8	05'.2	50° 29'.9	8'.9	11° 55'.8 S	9'.5	
154° 01'.7	05'.9	64° 57'.8	8'.9	46'.3	9'.5	
169° 01'.6	06'.6	79° 25'.7	9'.0	36'.8	9'.6	
184° 01'.6	17° 07'.3 S	93° 53'.7	9'.0	11° 27'.2 S	9'.6	59'.0
199° 01'.5	08'.0	108° 21'.7	9'.2	17'.6	9'.8	
214° 01'.5	08'.7	122° 49'.9	9'.1	07'.8	9'.7	
229° 01'.4	09'.4	137° 18'.0	9'.2	10° 58'.1 S	9'.8	
244° 01'.3	10'.1	151° 46'.2	9'.3	48'.3	9'.9	
259° 01'.3	10'.8	166° 14'.5	9'.4	38'.4	10'.0	58'.9
274° 01'.2	11'.5	180° 42'.9	9'.4	28'.4	10'.0	
289° 01'.2	12'.2	195° 11'.3	9'.4	18'.4	10'.0	
304° 01'.1	12'.9	209° 39'.7	9'.6	08'.4	10'.1	
319° 01'.0	13'.6	224° 08'.3	9'.5	9° 58'.3 S	10'.1	
334° 01'.0	14'.3	238° 36'.8	9'.7	48'.2	10'.2	58'.8
349° 00'.9	15'.0	253° 05'.5	9'.7	38'.0	10'.3	
4° 00'.8	17° 15'.7 S	267° 34'.2	9'.7	9° 27'.7 S	10'.3	58'.8
19° 00'.8	16'.4	282° 02'.9	9'.8	17'.4	10'.3	
34° 00'.7	17'.1	296° 31'.7	9'.9	07'.1	10'.4	
49° 00'.7	17'.8	311° 00'.6	9'.9	8° 56'.7 S	10'.4	58'.7
64° 00'.6	18'.5	325° 29'.5	10'.0	46'.3	10'.5	
79° 00'.5	19'.2	339° 58'.5	10'.0	35'.8	10'.5	
94° 00'.5	19'.9	354° 27'.5	10'.1	25'.3	10'.5	
109° 00'.4	20'.6	8° 56'.6	10'.1	14'.8	10'.6	
124° 00'.3	21'.3	23° 25'.7	10'.1	04'.2	10'.6	58'.6
139° 00'.3	22'.0	37° 54'.8	10'.3	7° 53'.6 S	10'.7	
154° 00'.2	22'.7	52° 24'.1	10'.3	42'.9	10'.7	
169° 00'.1	23'.3	66° 53'.4	10'.3	32'.2	10'.7	
184° 00'.1	17° 24'.0 S	81° 22'.7	10'.4	7° 21'.5 S	10'.8	58'.6
199° 00'.0	24'.7	95° 52'.1	10'.4	10'.7	10'.8	58'.5
213° 59'.9	25'.4	110° 21'.5	10'.4	6° 59'.9 S	10'.8	
228° 59'.8	26'.1	124° 50'.9	10'.6	49'.1	10'.9	
243° 59'.8	26'.8	139° 20'.5	10'.5	38'.2	10'.9	
258° 59'.7	27'.5	153° 50'.0	10'.6	27'.3	10'.9	
273° 59'.6	28'.2	168° 19'.6	10'.7	16'.4	10'.9	58'.4
288° 59'.6	28'.9	182° 49'.3	10'.7	05'.5	11'.0	
303° 59'.5	29'.5	197° 19'.0	10'.7	5° 54'.5 S	11'.0	
318° 59'.4	30'.2	211° 48'.7	10'.8	43'.5	11'.0	
333° 59'.4	30'.9	226° 18'.5	10'.8	32'.5	11'.0	
348° 59'.3	31'.6	240° 48'.3	10'.9	21'.5	11'.1	58'.3
3° 59'.2	17° 32'.3 S	255° 18'.2	10'.9	5° 10'.4 S	11'.1	58'.3
18° 59'.1	33'.0	269° 48'.1	11'.0	4° 59'.3 S	11'.1	
33° 59'.1	33'.7	284° 18'.1	10'.9	48'.2	11'.1	
48° 59'.0	34'.3	298° 48'.0	11'.1	37'.1	11'.1	
63° 58'.9	35'.0	313° 18'.1	11'.0	26'.0	11'.2	58'.2
78° 58'.8	35'.7	327° 48'.1	11'.1	14'.8	11'.1	
93° 58'.8	36'.4	342° 18'.2	11'.2	03'.7	11'.2	
108° 58'.7	37'.1	356° 48'.4	11'.2	3° 52'.5 S	11'.2	
123° 58'.6	37'.7	11° 18'.6	11'.2	41'.3	11'.2	
138° 58'.5	38'.4	25° 48'.8	11'.2	30'.1	11'.2	58'.1
153° 58'.5	39'.1	40° 19'.0	11'.3	18'.9	11'.3	
168° 58'.4	39'.8	54° 49'.3	11'.3	07'.6	11'.2	
SD 16'.2	d 0'.7	SD	16'.1	16'.0	15'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11
N 72°	06:41	08:11	10:04	14:27	14:14	14:05
N 70°	06:33	07:52	09:19	14:03	14:00	13:58
68°	06:27	07:37	08:50	13:44	13:49	13:52
66°	06:21	07:25	08:29	13:29	13:40	13:48
64°	06:16	07:15	08:12	13:17	13:32	13:44
62°	06:11	07:06	07:57	13:07	13:25	13:40
60°	06:07	06:58	07:46	12:58	13:19	13:37
N 58°	06:03	06:51	07:35	12:50	13:14	13:34
56°	06:00	06:45	07:26	12:43	13:09	13:32
54°	05:57	06:39	07:18	12:36	13:05	13:30
52°	05:54	06:34	07:11	12:31	13:01	13:28
50°	05:51	06:30	07:05	12:26	12:58	13:26
45°	05:44	06:20	06:51	12:14	12:50	13:22
N 40°	05:38	06:11	06:39	12:05	12:44	13:19
35°	05:33	06:03	06:30	11:57	12:38	13:16
30°	05:27	05:56	06:21	11:50	12:33	13:13
20°	05:17	05:43	06:06	11:38	12:25	13:09
N 10°	05:06	05:31	05:53	11:28	12:18	13:05
0°	04:54	05:19	05:40	11:18	12:11	13:01
S 10°	04:40	05:06	05:28	11:08	12:04	12:58
20°	04:23	04:51	05:14	10:57	11:56	12:54
30°	04:02	04:33	04:59	10:45	11:48	12:49
35°	03:49	04:22	04:50	10:38	11:43	12:47
40°	03:32	04:09	04:39	10:30	11:37	12:44
45°	03:12	03:53	04:27	10:20	11:31	12:41
S 50°	02:44	03:34	04:12	10:09	11:23	12:37
52°	02:30	03:24	04:05	10:03	11:19	12:35
54°	02:13	03:13	03:57	09:57	11:15	12:33
56°	01:53	03:01	03:48	09:51	11:11	12:31
58°	01:25	02:46	03:38	09:44	11:06	12:28
S 60°	00:41	02:28	03:26	09:35	11:01	12:25
S 62°	-	02:06	03:13	09:25	10:54	12:22

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 9	Moonset 10	Moonset 11
N 72°	13:23	15:15	16:45	20:53	22:54	24:48
N 70°	14:07	15:34	16:53	21:15	23:06	24:52
68°	14:36	15:49	17:00	21:32	23:15	24:56
66°	14:58	16:02	17:06	21:46	23:23	24:58
64°	15:15	16:12	17:11	21:57	23:30	25:01
62°	15:30	16:21	17:16	22:07	23:36	25:03
60°	15:42	16:29	17:20	22:15	23:41	25:05
N 58°	15:52	16:36	17:24	22:22	23:45	25:06
56°	16:01	16:42	17:27	22:29	23:49	25:08
54°	16:09	16:48	17:30	22:34	23:52	25:09
52°	16:16	16:53	17:34	22:39	23:55	25:10
50°	16:23	16:58	17:36	22:44	23:58	25:11
45°	16:36	17:08	17:43	22:54	-	00:04
N 40°	16:48	17:17	17:49	23:02	-	00:09
35°	16:58	17:25	17:55	23:09	-	00:14
30°	17:07	17:32	18:00	23:15	-	00:17
20°	17:22	17:45	18:11	23:25	-	00:24
N 10°	17:35	17:57	18:22	23:35	-	00:30
0°	17:47	18:09	18:34	23:43	-	00:35
S 10°	18:00	18:22	18:48	23:52	-	00:40
20°	18:14	18:37	19:05	-	00:01	00:46
30°	18:30	18:55	19:26	-	00:11	00:52
35°	18:39	19:07	19:40	-	00:17	00:56
40°	18:49	19:20	19:57	-	00:23	01:00
45°	19:02	19:35	20:17	-	00:31	01:05
S 50°	19:17	19:55	20:45	00:05	00:40	01:10
52°	19:24	20:05	21:00	00:11	00:44	01:13
54°	19:32	20:16	21:17	00:18	00:49	01:16
56°	19:41	20:29	21:38	00:25	00:54	01:19
58°	19:52	20:44	22:07	00:33	01:00	01:22
S 60°	20:03	21:02	22:56	00:42	01:06	01:26
S 62°	20:17	21:25	-	00:52	01:14	01:30

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
9	16 12	16 09	11:44	17:30	05:03	6d 42%
10	16 06	16 04	11:44	18:23	05:57	7d 53%
11	16 00	15 57	11:44	19:13	06:48	8d 64%

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2013 November 12, 13, 14 (Tue, Wed, Thur)

GMT	ARIES	VENUS -4.5		MARS +1.4		JUPITER -2.5		SATURN +0.5	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
12 Tuesday 00	51° 17'.3	134° 15'.1	27° 01'.5 S	243° 30'.9	7° 02'.8 N	299° 08'.8	21° 52'.9 N	188° 12'.8	14° 16'.8 S
01	66° 19'.8	149° 15'.0	01'.4	258° 32'.1	02'.2	314° 11'.3	52'.9	203° 14'.9	16'.9
02	81° 22'.2	164° 14'.9	01'.3	273° 33'.2	01'.7	329° 13'.8	52'.9	218° 17'.1	17'.0
03	96° 24'.7	179° 14'.8	01'.1	288° 34'.4	01'.2	344° 16'.3	52'.9	233° 19'.3	17'.1
04	111° 27'.2	194° 14'.8	01'.0	303° 35'.5	00'.7	359° 18'.8	52'.9	248° 21'.4	17'.2
05	126° 29'.6	209° 14'.7	00'.9	318° 36'.7	00'.1	14° 21'.3	53'.0	263° 23'.6	17'.2
06	141° 32'.1	224° 14'.6	00'.7	333° 37'.8	6° 59'.6 N	29° 23'.8	53'.0	278° 25'.8	17'.3
07	156° 34'.6	239° 14'.5	00'.6	348° 39'.0	59'.1	44° 26'.3	53'.0	293° 28'.0	17'.4
08	171° 37'.0	254° 14'.4	00'.5	3° 40'.1	58'.6	59° 28'.8	53'.0	308° 30'.1	17'.5
09	186° 39'.5	269° 14'.3	00'.3	18° 41'.3	58'.0	74° 31'.3	53'.0	323° 32'.3	17'.6
10	201° 41'.9	284° 14'.2	00'.2	33° 42'.4	57'.5	89° 33'.8	53'.0	338° 34'.5	17'.7
11	216° 44'.4	299° 14'.1	00'.1	48° 43'.6	57'.0	104° 36'.3	53'.0	353° 36'.6	17'.8
12	231° 46'.9	314° 14'.0	26° 59'.9 S	63° 44'.7	6° 56'.5 N	119° 38'.8	21° 53'.0 N	8° 38'.8	14° 17'.9 S
13	246° 49'.3	329° 14'.0	59'.8	78° 45'.9	55'.9	134° 41'.4	53'.0	23° 41'.0	17'.9
14	261° 51'.8	344° 13'.9	59'.7	93° 47'.0	55'.4	149° 43'.9	53'.1	38° 43'.1	18'.0
15	276° 54'.3	359° 13'.8	59'.5	108° 48'.2	54'.9	164° 46'.4	53'.1	53° 45'.3	18'.1
16	291° 56'.7	14° 13'.7	59'.4	123° 49'.3	54'.4	179° 48'.9	53'.1	68° 47'.5	18'.2
17	306° 59'.2	29° 13'.6	59'.2	138° 50'.5	53'.8	194° 51'.4	53'.1	83° 49'.6	18'.3
18	322° 01'.7	44° 13'.6	59'.1	153° 51'.6	53'.3	209° 53'.9	53'.1	98° 51'.8	18'.4
19	337° 04'.1	59° 13'.5	59'.0	168° 52'.8	52'.8	224° 56'.4	53'.1	113° 54'.0	18'.5
20	352° 06'.6	74° 13'.4	58'.8	183° 53'.9	52'.3	239° 58'.9	53'.1	128° 56'.1	18'.6
21	7° 09'.1	89° 13'.3	58'.7	198° 55'.1	51'.7	255° 01'.5	53'.1	143° 58'.3	18'.6
22	22° 11'.5	104° 13'.3	58'.5	213° 56'.2	51'.2	270° 04'.0	53'.2	159° 00'.5	18'.7
23	37° 14'.0	119° 13'.2	58'.4	228° 57'.4	50'.7	285° 06'.5	53'.2	174° 02'.7	18'.8
13 Wednesday 00	52° 16'.4	134° 13'.1	26° 58'.2 S	243° 58'.5	6° 50'.2 N	300° 09'.0	21° 53'.2 N	189° 04'.8	14° 18'.9 S
01	67° 18'.9	149° 13'.0	58'.1	258° 59'.7	49'.6	315° 11'.5	53'.2	204° 07'.0	19'.0
02	82° 21'.4	164° 13'.0	57'.9	274° 00'.8	49'.1	330° 14'.0	53'.2	219° 09'.2	19'.1
03	97° 23'.8	179° 12'.9	57'.8	289° 02'.0	48'.6	345° 16'.5	53'.2	234° 11'.3	19'.2
04	112° 26'.3	194° 12'.8	57'.6	304° 03'.2	48'.1	0° 19'.1	53'.2	249° 13'.5	19'.2
05	127° 28'.8	209° 12'.8	57'.5	319° 04'.3	47'.5	15° 21'.6	53'.2	264° 15'.7	19'.3
06	142° 31'.2	224° 12'.7	57'.3	334° 05'.5	47'.0	30° 24'.1	53'.3	279° 17'.8	19'.4
07	157° 33'.7	239° 12'.7	57'.2	349° 06'.6	46'.5	45° 26'.6	53'.3	294° 20'.0	19'.5
08	172° 36'.2	254° 12'.6	57'.0	4° 07'.8	46'.0	60° 29'.1	53'.3	309° 22'.2	19'.6
09	187° 38'.6	269° 12'.5	56'.8	19° 08'.9	45'.4	75° 31'.6	53'.3	324° 24'.3	19'.7
10	202° 41'.1	284° 12'.5	56'.7	34° 10'.1	44'.9	90° 34'.2	53'.3	339° 26'.5	19'.8
11	217° 43'.5	299° 12'.4	56'.5	49° 11'.2	44'.4	105° 36'.7	53'.3	354° 28'.7	19'.9
12	232° 46'.0	314° 12'.4	26° 56'.4 S	64° 12'.4	6° 43'.9 N	120° 39'.2	21° 53'.3 N	9° 30'.9	14° 19'.9 S
13	247° 48'.5	329° 12'.3	56'.2	79° 13'.6	43'.3	135° 41'.7	53'.4	24° 33'.0	20'.0
14	262° 50'.9	344° 12'.3	56'.1	94° 14'.7	42'.8	150° 44'.2	53'.4	39° 35'.2	20'.1
15	277° 53'.4	359° 12'.2	55'.9	109° 15'.9	42'.3	165° 46'.8	53'.4	54° 37'.4	20'.2
16	292° 55'.9	14° 12'.2	55'.7	124° 17'.0	41'.8	180° 49'.3	53'.4	69° 39'.5	20'.3
17	307° 58'.3	29° 12'.1	55'.6	139° 18'.2	41'.2	195° 51'.8	53'.4	84° 41'.7	20'.4
18	323° 00'.8	44° 12'.1	55'.4	154° 19'.3	40'.7	210° 54'.3	53'.4	99° 43'.9	20'.5
19	338° 03'.3	59° 12'.0	55'.2	169° 20'.5	40'.2	225° 56'.8	53'.4	114° 46'.0	20'.5
20	353° 05'.7	74° 12'.0	55'.1	184° 21'.6	39'.7	240° 59'.4	53'.4	129° 48'.2	20'.6
21	8° 08'.2	89° 12'.0	54'.9	199° 22'.8	39'.1	256° 01'.9	53'.5	144° 50'.4	20'.7
22	23° 10'.7	104° 11'.9	54'.7	214° 24'.0	38'.6	271° 04'.4	53'.5	159° 52'.5	20'.8
23	38° 13'.1	119° 11'.9	54'.6	229° 25'.1	38'.1	286° 06'.9	53'.5	174° 54'.7	20'.9
14 Thursday 00	53° 15'.6	134° 11'.8	26° 54'.4 S	244° 26'.3	6° 37'.6 N	301° 09'.5	21° 53'.5 N	189° 56'.9	14° 21'.0 S
01	68° 18'.0	149° 11'.8	54'.2	259° 27'.4	37'.0	316° 12'.0	53'.5	204° 59'.1	21'.1
02	83° 20'.5	164° 11'.8	54'.1	274° 28'.6	36'.5	331° 14'.5	53'.5	220° 01'.2	21'.2
03	98° 23'.0	179° 11'.7	53'.9	289° 29'.7	36'.0	346° 17'.0	53'.5	235° 03'.4	21'.2
04	113° 25'.4	194° 11'.7	53'.7	304° 30'.9	35'.5	1° 19'.6	53'.6	250° 05'.6	21'.3
05	128° 27'.9	209° 11'.7	53'.5	319° 32'.1	34'.9	16° 22'.1	53'.6	265° 07'.7	21'.4
06	143° 30'.4	224° 11'.6	53'.4	334° 33'.2	34'.4	31° 24'.6	53'.6	280° 09'.9	21'.5
07	158° 32'.8	239° 11'.6	53'.2	349° 34'.4	33'.9	46° 27'.1	53'.6	295° 12'.1	21'.6
08	173° 35'.3	254° 11'.6	53'.0	4° 35'.5	33'.4	61° 29'.7	53'.6	310° 14'.2	21'.7
09	188° 37'.8	269° 11'.5	52'.8	19° 36'.7	32'.8	76° 32'.2	53'.6	325° 16'.4	21'.8
10	203° 40'.2	284° 11'.5	52'.6	34° 37'.9	32'.3	91° 34'.7	53'.6	340° 18'.6	21'.8
11	218° 42'.7	299° 11'.5	52'.5	49° 39'.0	31'.8	106° 37'.2	53'.7	355° 20'.7	21'.9
12	233° 45'.1	314° 11'.5	26° 52'.3 S	64° 40'.2	6° 31'.3 N	121° 39'.8	21° 53'.7 N	10° 22'.9	14° 22'.0 S
13	248° 47'.6	329° 11'.5	52'.1	79° 41'.3	30'.8	136° 42'.3	53'.7	25° 25'.1	22'.1
14	263° 50'.1	344° 11'.4	51'.9	94° 42'.5	30'.2	151° 44'.8	53'.7	40° 27'.3	22'.2
15	278° 52'.5	359° 11'.4	51'.7	109° 43'.7	29'.7	166° 47'.4	53'.7	55° 29'.4	22'.3
16	293° 55'.0	14° 11'.4	51'.6	124° 44'.8	29'.2	181° 49'.9	53'.7	70° 31'.6	22'.4
17	308° 57'.5	29° 11'.4	51'.4	139° 46'.0	28'.7	196° 52'.4	53'.7	85° 33'.8	22'.4
18	323° 59'.9	44° 11'.4	51'.2	154° 47'.1	28'.1	211° 54'.9	53'.8	100° 35'.9	22'.5
19	339° 02'.4	59° 11'.4	51'.0	169° 48'.3	27'.6	226° 57'.5	53'.8	115° 38'.1	22'.6
20	354° 04'.9	74° 11'.4	50'.8	184° 49'.5	27'.1	242° 00'.0	53'.8	130° 40'.3	22'.7
21	9° 07'.3	89° 11'.3	50'.6	199° 50'.6	26'.6	257° 02'.5	53'.8	145° 42'.4	22'.8
22	24° 09'.8	104° 11'.3	50'.4	214° 51'.8	26'.0	272° 05'.1	53'.8	160° 44'.6	22'.9
23	39° 12'.3	119° 11'.3	50'.2	229° 53'.0	25'.5	287° 07'.6	53'.8	175° 46'.8	23'.0
	M.P. 20:28	v -0'.1	d 0'.2	v 1'.2	d 0'.5	v 2'.5	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.7	40° 15'.0 S
Achernar	335° 26'.1	57° 10'.1 S
Acrux	173° 09'.4	63° 10'.3 S
Adhara	255° 12'.1	28° 59'.4 S
Aldebaran	290° 48'.7	16° 32'.1 N
Alioth	166° 21'.0	55° 52'.9 N
Alkaid	152° 59'.2	49° 14'.6 N
Alnair	27° 43'.4	46° 53'.7 S
Alnilam	275° 45'.8	1° 11'.7 S
Alphard	217° 55'.8	8° 43'.1 S
Alphecca	126° 11'.2	26° 40'.3 N
Alpheratz	357° 42'.9	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.7 N
Atria	107° 28'.3	69° 03'.0 S
Avior	234° 17'.6	59° 33'.1 S
Bellatrix	278° 31'.4	6° 21'.6 N
Betelgeuse	271° 00'.7	7° 24'.5 N
Canopus	263° 55'.6	52° 42'.1 S
Capella	280° 33'.6	46° 00'.5 N
Deneb	49° 31'.4	45° 20'.2 N
Denebola	182° 33'.6	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.7	61° 40'.2 N
Elnath	278° 11'.9	28° 37'.0 N
Eltanin	90° 46'.4	51° 29'.6 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.6	29° 32'.9 S
Gacrux	172° 00'.9	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.0 S
Hadar	148° 48'.0	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.3	74° 05'.9 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.1 S
Miaplacidus	221° 39'.4	69° 46'.3 S
Mirfak	308° 39'.4	49° 54'.6 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.0	56° 41'.5 S
Polaris	317° 10'.3	89° 19'.4 N
Pollux	243° 27'.2	27° 59'.3 N
Procyon	244° 59'.3	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.3	11° 53'.8 N
Rigel	281° 11'.5	8° 11'.2 S
Rigil Kent	139° 51'.9	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.2	16° 44'.1 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.2	43° 29'.2 S
Vega	80° 39'.1	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	81° 56'.7	15:03
Mars	191° 42'.1	07:44
Jupiter	247° 52'.6	03:59
Saturn	136° 48'.4	11:22

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
12 00	183° 58'.3	17° 40'.5 S	69° 19'.6	11'.3	2° 56'.4 S	11'.2	58'.1
01	198° 58'.2	41'.1	83° 49'.9	11'.4	45'.2	11'.3	58'.0
02	213° 58'.2	41'.8	98° 20'.3	11'.4	33'.9	11'.2	
03	228° 58'.1	42'.5	112° 50'.7	11'.4	22'.7	11'.3	
04	243° 58'.0	43'.2	127° 21'.1	11'.5	11'.4	11'.3	
05	258° 57'.9	43'.8	141° 51'.6	11'.5	00'.1	11'.2	
06	273° 57'.8	44'.5	156° 22'.1	11'.5	1° 48'.9 S	11'.3	57'.9
07	288° 57'.8	45'.2	170° 52'.6	11'.6	37'.6	11'.3	
08	303° 57'.7	45'.9	185° 23'.2	11'.5	26'.3	11'.3	
09	318° 57'.6	46'.5	199° 53'.7	11'.6	15'.0	11'.2	
10	333° 57'.5	47'.2	214° 24'.3	11'.7	03'.8	11'.3	
11	348° 57'.4	47'.9	228° 55'.0	11'.6	0° 52'.5 S	11'.3	57'.8
12	3° 57'.4	17° 48'.6 S	243° 25'.6	11'.7	0° 41'.2 S	11'.2	57'.8
13	18° 57'.3	49'.2	257° 56'.3	11'.7	30'.0	11'.3	
14	33° 57'.2	49'.9	272° 27'.0	11'.7	18'.7	11'.2	
15	48° 57'.1	50'.6	286° 57'.7	11'.7	07'.5	11'.3	
16	63° 57'.0	51'.2	301° 28'.4	11'.8	0° 03'.8 N	11'.2	57'.7
17	78° 56'.9	51'.9	315° 59'.2	11'.7	15'.0	11'.2	
18	93° 56'.9	52'.6	330° 29'.9	11'.8	26'.2	11'.2	
19	108° 56'.8	53'.2	345° 00'.7	11'.9	37'.4	11'.3	
20	123° 56'.7	53'.9	359° 31'.6	11'.8	48'.7	11'.2	57'.6
21	138° 56'.6	54'.6	14° 02'.4	11'.8	59'.9	11'.1	
22	153° 56'.5	55'.2	28° 33'.2	11'.9	1° 11'.0 N	11'.2	
23	168° 56'.4	55'.9	43° 04'.1	11'.9	22'.2	11'.2	
13 00	183° 56'.4	17° 56'.6 S	57° 35'.0	11'.9	1° 33'.4 N	11'.1	57'.6
01	198° 56'.3	57'.2	72° 05'.9	11'.9	44'.5	11'.1	57'.5
02	213° 56'.2	57'.9	86° 36'.8	11'.9	55'.6	11'.1	
03	228° 56'.1	58'.6	101° 07'.7	12'.0	2° 06'.7 N	11'.1	
04	243° 56'.0	59'.2	115° 38'.7	11'.9	17'.8	11'.1	
05	258° 55'.9	59'.9	130° 09'.6	12'.0	28'.9	11'.1	
06	273° 55'.8	18° 00'.6 S	144° 40'.6	11'.9	40'.0	11'.0	57'.4
07	288° 55'.7	01'.2	159° 11'.5	12'.0	51'.0	11'.0	
08	303° 55'.7	01'.9	173° 42'.5	12'.0	3° 02'.0 N	11'.0	
09	318° 55'.6	02'.5	188° 13'.5	12'.0	13'.0	11'.0	
10	333° 55'.5	03'.2	202° 44'.5	12'.0	24'.0	10'.9	
11	348° 55'.4	03'.9	217° 15'.5	12'.0	34'.9	10'.9	57'.3
12	3° 55'.3	18° 04'.5 S	231° 46'.5	12'.1	3° 45'.8 N	10'.9	57'.3
13	18° 55'.2	05'.2	246° 17'.6	12'.0	56'.7	10'.9	
14	33° 55'.1	05'.8	260° 48'.6	12'.0	4° 07'.6 N	10'.8	
15	48° 55'.0	06'.5	275° 19'.6	12'.1	18'.4	10'.8	
16	63° 54'.9	07'.1	289° 50'.7	12'.0	29'.2	10'.8	57'.2
17	78° 54'.8	07'.8	304° 21'.7	12'.1	40'.0	10'.7	
18	93° 54'.8	08'.5	318° 52'.8	12'.0	50'.7	10'.8	
19	108° 54'.7	09'.1	333° 23'.8	12'.1	5° 01'.5 N	10'.6	
20	123° 54'.6	09'.8	347° 54'.9	12'.1	12'.1	10'.7	57'.1
21	138° 54'.5	10'.4	2° 26'.0	12'.0	22'.8	10'.6	
22	153° 54'.4	11'.1	16° 57'.0	12'.1	33'.4	10'.6	
23	168° 54'.3	11'.7	31° 28'.1	12'.1	44'.0	10'.5	
14 00	183° 54'.2	18° 12'.4 S	45° 59'.2	12'.0	5° 54'.5 N	10'.6	57'.1
01	198° 54'.1	13'.0	60° 30'.2	12'.1	6° 05'.1 N	10'.4	57'.0
02	213° 54'.0	13'.7	75° 01'.3	12'.1	15'.5	10'.5	
03	228° 53'.9	14'.3	89° 32'.4	12'.0	26'.0	10'.4	
04	243° 53'.8	15'.0	104° 03'.4	12'.1	36'.4	10'.3	
05	258° 53'.7	15'.6	118° 34'.5	12'.1	46'.7	10'.4	
06	273° 53'.6	16'.3	133° 05'.6	12'.0	57'.1	10'.2	56'.9
07	288° 53'.5	16'.9	147° 36'.6	12'.1	7° 07'.3 N	10'.3	
08	303° 53'.4	17'.6	162° 07'.7	12'.0	17'.6	10'.2	
09	318° 53'.3	18'.2	176° 38'.7	12'.1	27'.8	10'.1	
10	333° 53'.2	18'.9	191° 09'.8	12'.0	37'.9	10'.1	
11	348° 53'.1	19'.5	205° 40'.8	12'.0	48'.0	10'.1	56'.8
12	3° 53'.0	18° 20'.2 S	220° 11'.8	12'.1	7° 58'.1 N	10'.0	56'.8
13	18° 52'.9	20'.8	234° 42'.9	12'.0	8° 08'.1 N	10'.0	
14	33° 52'.8	21'.4	249° 13'.9	12'.0	18'.1	9'.9	
15	48° 52'.7	22'.1	263° 44'.9	12'.0	28'.0	9'.9	
16	63° 52'.6	22'.7	278° 15'.9	12'.0	37'.9	9'.8	56'.7
17	78° 52'.5	23'.4	292° 46'.9	12'.0	47'.7	9'.8	
18	93° 52'.4	24'.0	307° 17'.9	12'.0	57'.5	9'.7	
19	108° 52'.3	24'.7	321° 48'.9	12'.0	9° 07'.2 N	9'.7	
20	123° 52'.2	25'.3	336° 19'.9	12'.0	16'.9	9'.6	
21	138° 52'.1	25'.9	350° 50'.9	12'.0	26'.5	9'.6	56'.6
22	153° 52'.0	26'.6	5° 21'.9	11'.9	36'.1	9'.5	
23	168° 51'.9	27'.2	19° 52'.8	12'.0	45'.6	9'.4	
	SD 16'.2	d 0'.7	SD	15'.8	15'.6	15'.5	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14
N 72°	06:53	08:25	10:35	13:56	13:47	13:38
N 70°	06:43	08:04	09:37	13:55	13:53	13:50
68°	06:35	07:48	09:04	13:55	13:57	14:00
66°	06:29	07:34	08:40	13:54	14:01	14:08
64°	06:23	07:23	08:21	13:54	14:04	14:15
62°	06:18	07:13	08:06	13:54	14:07	14:21
60°	06:13	07:05	07:53	13:53	14:09	14:26
N 58°	06:09	06:57	07:42	13:53	14:11	14:30
56°	06:05	06:51	07:33	13:53	14:13	14:35
54°	06:02	06:45	07:24	13:53	14:15	14:38
52°	05:58	06:39	07:17	13:53	14:17	14:42
50°	05:55	06:34	07:10	13:52	14:18	14:45
45°	05:48	06:23	06:55	13:52	14:21	14:51
N 40°	05:41	06:14	06:43	13:52	14:24	14:57
35°	05:35	06:06	06:33	13:52	14:26	15:02
30°	05:29	05:58	06:23	13:51	14:29	15:06
20°	05:18	05:45	06:08	13:51	14:32	15:13
N 10°	05:06	05:32	05:54	13:51	14:35	15:20
0°	04:54	05:19	05:41	13:50	14:39	15:26
S 10°	04:39	05:05	05:28	13:50	14:42	15:33
20°	04:22	04:50	05:13	13:50	14:45	15:39
30°	04:00	04:31	04:57	13:50	14:49	15:47
35°	03:46	04:19	04:47	13:50	14:51	15:52
40°	03:29	04:06	04:36	13:49	14:54	15:57
45°	03:07	03:50	04:23	13:49	14:57	16:03
S 50°	02:38	03:29	04:07	13:49	15:00	16:10
52°	02:23	03:19	04:00	13:49	15:02	16:13
54°	02:05	03:07	03:51	13:49	15:04	16:17
56°	01:42	02:54	03:42	13:49	15:06	16:21
58°	01:10	02:38	03:31	13:49	15:08	16:25
S 60°	-	02:19	03:19	13:48	15:10	16:31
S 62°	-	01:54	03:04	13:48	15:13	16:36

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 12	Moonset 13	Moonset 14
N 72°	12:53	15:02	16:35	00:48	02:38	04:28
N 70°	13:50	15:23	16:44	00:52	02:36	04:18
68°	14:24	15:40	16:52	00:56	02:33	04:10
66°	14:48	15:54	16:59	00:58	02:31	04:03
64°	15:06	16:05	17:05	01:01	02:30	03:57
62°	15:22	16:15	17:10	01:03	02:29	03:53
60°	15:35	16:23	17:15	01:05	02:27	03:48
N 58°	15:46	16:31	17:19	01:06	02:26	03:45
56°	15:55	16:37	17:23	01:08	02:25	03:41
54°	16:04	16:43	17:26	01:09	02:24	03:39
52°	16:12	16:49	17:30	01:10	02:24	03:36
50°	16:18	16:54	17:33	01:11	02:23	03:33
45°	16:33	17:05	17:40	01:13	02:21	03:28
N 40°	16:45	17:14	17:47	01:15	02:20	03:24
35°	16:56	17:23	17:53	01:17	02:19	03:20
30°	17:05	17:30	17:59	01:18	02:18	03:17
20°	17:21	17:44	18:10	01:21	02:16	03:11
N 10°	17:35	17:57	18:22	01:23	02:15	03:06
0°	17:48	18:10	18:35	01:25	02:13	03:01
S 10°	18:01	18:23	18:49	01:27	02:12	02:57
20°	18:16	18:39	19:07	01:29	02:10	02:52
30°	18:32	18:58	19:29	01:31	02:09	02:46
35°	18:42	19:10	19:44	01:33	02:08	02:43
40°	18:53	19:23	20:01	01:34	02:07	02:39
45°	19:06	19:40	20:23	01:36	02:05	02:35
S 50°	19:22	20:01	20:52	01:38	02:04	02:30
52°	19:30	20:11	21:08	01:39	02:03	02:27
54°	19:38	20:23	21:26	01:40	02:02	02:25
56°	19:48	20:37	21:50	01:41	02:01	02:22
58°	19:59	20:53	22:24	01:42	02:00	02:19
S 60°	20:12	21:13	-	01:43	01:59	02:15
S 62°	20:26	21:38	-	01:45	01:58	02:11

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
12	15 53	15 50	11:44	20:02	07:38	9d 74%
13	15 46	15 41	11:44	20:50	08:26	10d 83%
14	15 37	15 32	11:44	21:38	09:14	11d 90%

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2013 November 15, 16, 17 (Fri, Saty, Sun)

GMT	ARIES	VENUS -4.5		MARS +1.4		JUPITER -2.5		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
15 Friday 00	54° 14'.7	134° 11'.3	26° 50'.0 S	244° 54'.1	6° 25'.0 N	302° 10'.1	21° 53'.8 N	190° 48'.9	14° 23'.0 S
01	69° 17'.2	149° 11'.3	49'.9	259° 55'.3	24'.5	317° 12'.7	53'.9	205° 51'.1	23'.1
02	84° 19'.6	164° 11'.3	49'.7	274° 56'.4	23'.9	332° 15'.2	53'.9	220° 53'.3	23'.2
03	99° 22'.1	179° 11'.3	49'.5	289° 57'.6	23'.4	347° 17'.7	53'.9	235° 55'.5	23'.3
04	114° 24'.6	194° 11'.3	49'.3	304° 58'.8	22'.9	2° 20'.3	53'.9	250° 57'.6	23'.4
05	129° 27'.0	209° 11'.3	49'.1	319° 59'.9	22'.4	17° 22'.8	53'.9	265° 59'.8	23'.5
06	144° 29'.5	224° 11'.3	48'.9	335° 01'.1	21'.8	32° 25'.3	53'.9	281° 02'.0	23'.6
07	159° 32'.0	239° 11'.3	48'.7	350° 02'.3	21'.3	47° 27'.9	54'.0	296° 04'.1	23'.7
08	174° 34'.4	254° 11'.3	48'.5	5° 03'.4	20'.8	62° 30'.4	54'.0	311° 06'.3	23'.7
09	189° 36'.9	269° 11'.3	48'.3	20° 04'.6	20'.3	77° 32'.9	54'.0	326° 08'.5	23'.8
10	204° 39'.4	284° 11'.4	48'.1	35° 05'.7	19'.8	92° 35'.5	54'.0	341° 10'.6	23'.9
11	219° 41'.8	299° 11'.4	47'.9	50° 06'.9	19'.2	107° 38'.0	54'.0	356° 12'.8	24'.0
12	234° 44'.3	314° 11'.4	26° 47'.7 S	65° 08'.1	6° 18'.7 N	122° 40'.5	21° 54'.0 N	11° 15'.0	14° 24'.1 S
13	249° 46'.8	329° 11'.4	47'.5	80° 09'.2	18'.2	137° 43'.1	54'.0	26° 17'.1	24'.2
14	264° 49'.2	344° 11'.4	47'.3	95° 10'.4	17'.7	152° 45'.6	54'.1	41° 19'.3	24'.3
15	279° 51'.7	359° 11'.4	47'.1	110° 11'.6	17'.1	167° 48'.2	54'.1	56° 21'.5	24'.3
16	294° 54'.1	14° 11'.4	46'.9	125° 12'.7	16'.6	182° 50'.7	54'.1	71° 23'.7	24'.4
17	309° 56'.6	29° 11'.5	46'.6	140° 13'.9	16'.1	197° 53'.2	54'.1	86° 25'.8	24'.5
18	324° 59'.1	44° 11'.5	46'.4	155° 15'.1	15'.6	212° 55'.8	54'.1	101° 28'.0	24'.6
19	340° 01'.5	59° 11'.5	46'.2	170° 16'.2	15'.0	227° 58'.3	54'.1	116° 30'.2	24'.7
20	355° 04'.0	74° 11'.5	46'.0	185° 17'.4	14'.5	243° 00'.8	54'.2	131° 32'.3	24'.8
21	10° 06'.5	89° 11'.6	45'.8	200° 18'.6	14'.0	258° 03'.4	54'.2	146° 34'.5	24'.9
22	25° 08'.9	104° 11'.6	45'.6	215° 19'.7	13'.5	273° 05'.9	54'.2	161° 36'.7	24'.9
23	40° 11'.4	119° 11'.6	45'.4	230° 20'.9	13'.0	288° 08'.5	54'.2	176° 38'.8	25'.0
16 Saturday 00	55° 13'.9	134° 11'.6	26° 45'.2 S	245° 22'.1	6° 12'.4 N	303° 11'.0	21° 54'.2 N	191° 41'.0	14° 25'.1 S
01	70° 16'.3	149° 11'.7	45'.0	260° 23'.2	11'.9	318° 13'.6	54'.2	206° 43'.2	25'.2
02	85° 18'.8	164° 11'.7	44'.7	275° 24'.4	11'.4	333° 16'.1	54'.3	221° 45'.4	25'.3
03	100° 21'.2	179° 11'.7	44'.5	290° 25'.6	10'.9	348° 18'.6	54'.3	236° 47'.5	25'.4
04	115° 23'.7	194° 11'.8	44'.3	305° 26'.7	10'.3	3° 21'.2	54'.3	251° 49'.7	25'.5
05	130° 26'.2	209° 11'.8	44'.1	320° 27'.9	09'.8	18° 23'.7	54'.3	266° 51'.9	25'.5
06	145° 28'.6	224° 11'.8	43'.9	335° 29'.1	09'.3	33° 26'.3	54'.3	281° 54'.0	25'.6
07	160° 31'.1	239° 11'.9	43'.7	350° 30'.2	08'.8	48° 28'.8	54'.3	296° 56'.2	25'.7
08	175° 33'.6	254° 11'.9	43'.4	5° 31'.4	08'.2	63° 31'.4	54'.4	311° 58'.4	25'.8
09	190° 36'.0	269° 12'.0	43'.2	20° 32'.6	07'.7	78° 33'.9	54'.4	327° 00'.5	25'.9
10	205° 38'.5	284° 12'.0	43'.0	35° 33'.7	07'.2	93° 36'.4	54'.4	342° 02'.7	26'.0
11	220° 41'.0	299° 12'.1	42'.8	50° 34'.9	06'.7	108° 39'.0	54'.4	357° 04'.9	26'.0
12	235° 43'.4	314° 12'.1	26° 42'.5 S	65° 36'.1	6° 06'.2 N	123° 41'.5	21° 54'.4 N	12° 07'.1	14° 26'.1 S
13	250° 45'.9	329° 12'.2	42'.3	80° 37'.3	05'.6	138° 44'.1	54'.4	27° 09'.2	26'.2
14	265° 48'.4	344° 12'.2	42'.1	95° 38'.4	05'.1	153° 46'.6	54'.5	42° 11'.4	26'.3
15	280° 50'.8	359° 12'.3	41'.9	110° 39'.6	04'.6	168° 49'.2	54'.5	57° 13'.6	26'.4
16	295° 53'.3	14° 12'.3	41'.6	125° 40'.8	04'.1	183° 51'.7	54'.5	72° 15'.7	26'.5
17	310° 55'.7	29° 12'.4	41'.4	140° 41'.9	03'.5	198° 54'.3	54'.5	87° 17'.9	26'.6
18	325° 58'.2	44° 12'.4	41'.2	155° 43'.1	03'.0	213° 56'.8	54'.5	102° 20'.1	26'.6
19	341° 00'.7	59° 12'.5	41'.0	170° 44'.3	02'.5	228° 59'.4	54'.5	117° 22'.2	26'.7
20	356° 03'.1	74° 12'.5	40'.7	185° 45'.4	02'.0	244° 01'.9	54'.6	132° 24'.4	26'.8
21	11° 05'.6	89° 12'.6	40'.5	200° 46'.6	01'.5	259° 04'.5	54'.6	147° 26'.6	26'.9
22	26° 08'.1	104° 12'.7	40'.3	215° 47'.8	00'.9	274° 07'.0	54'.6	162° 28'.8	27'.0
23	41° 10'.5	119° 12'.7	40'.0	230° 49'.0	00'.4	289° 09'.6	54'.6	177° 30'.9	27'.1
17 Sunday 00	56° 13'.0	134° 12'.8	26° 39'.8 S	245° 50'.1	5° 59'.9 N	304° 12'.1	21° 54'.6 N	192° 33'.1	14° 27'.2 S
01	71° 15'.5	149° 12'.9	39'.6	260° 51'.3	59'.4	319° 14'.7	54'.6	207° 35'.3	27'.2
02	86° 17'.9	164° 12'.9	39'.3	275° 52'.5	58'.8	334° 17'.2	54'.7	222° 37'.4	27'.3
03	101° 20'.4	179° 13'.0	39'.1	290° 53'.6	58'.3	349° 19'.8	54'.7	237° 39'.6	27'.4
04	116° 22'.9	194° 13'.1	38'.9	305° 54'.8	57'.8	4° 22'.3	54'.7	252° 41'.8	27'.5
05	131° 25'.3	209° 13'.1	38'.6	320° 56'.0	57'.3	19° 24'.9	54'.7	267° 43'.9	27'.6
06	146° 27'.8	224° 13'.2	38'.4	335° 57'.2	56'.8	34° 27'.4	54'.7	282° 46'.1	27'.7
07	161° 30'.2	239° 13'.3	38'.1	350° 58'.3	56'.2	49° 30'.0	54'.8	297° 48'.3	27'.8
08	176° 32'.7	254° 13'.4	37'.9	5° 59'.5	55'.7	64° 32'.5	54'.8	312° 50'.5	27'.8
09	191° 35'.2	269° 13'.5	37'.7	21° 00'.7	55'.2	79° 35'.1	54'.8	327° 52'.6	27'.9
10	206° 37'.6	284° 13'.5	37'.4	36° 01'.8	54'.7	94° 37'.6	54'.8	342° 54'.8	28'.0
11	221° 40'.1	299° 13'.6	37'.2	51° 03'.0	54'.1	109° 40'.2	54'.8	357° 57'.0	28'.1
12	236° 42'.6	314° 13'.7	26° 36'.9 S	66° 04'.2	5° 53'.6 N	124° 42'.7	21° 54'.8 N	12° 59'.1	14° 28'.2 S
13	251° 45'.0	329° 13'.8	36'.7	81° 05'.4	53'.1	139° 45'.3	54'.9	28° 01'.3	28'.3
14	266° 47'.5	344° 13'.9	36'.4	96° 06'.5	52'.6	154° 47'.8	54'.9	43° 03'.5	28'.4
15	281° 50'.0	359° 14'.0	36'.2	111° 07'.7	52'.1	169° 50'.4	54'.9	58° 05'.6	28'.4
16	296° 52'.4	14° 14'.1	35'.9	126° 08'.9	51'.5	184° 52'.9	54'.9	73° 07'.8	28'.5
17	311° 54'.9	29° 14'.2	35'.7	141° 10'.1	51'.0	199° 55'.5	54'.9	88° 10'.0	28'.6
18	326° 57'.3	44° 14'.2	35'.4	156° 11'.2	50'.5	214° 58'.1	55'.0	103° 12'.2	28'.7
19	341° 59'.8	59° 14'.3	35'.2	171° 12'.4	50'.0	230° 00'.6	55'.0	118° 14'.3	28'.8
20	357° 02'.3	74° 14'.4	34'.9	186° 13'.6	49'.4	245° 03'.2	55'.0	133° 16'.5	28'.9
21	12° 04'.7	89° 14'.5	34'.7	201° 14'.8	48'.9	260° 05'.7	55'.0	148° 18'.7	28'.9
22	27° 07'.2	104° 14'.6	34'.4	216° 15'.9	48'.4	275° 08'.3	55'.0	163° 20'.8	29'.0
23	42° 09'.7	119° 14'.7	34'.2	231° 17'.1	47'.9	290° 10'.8	55'.0	178° 23'.0	29'.1
	M.P. 20:16	v 0'.0	d 0'.2	v 1'.2	d 0'.5	v 2'.5	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.7	40° 15'.0 S
Achernar	335° 26'.1	57° 10'.1 S
Acrux	173° 09'.4	63° 10'.3 S
Adhara	255° 12'.0	28° 59'.5 S
Aldebaran	290° 48'.7	16° 32'.1 N
Alioth	166° 21'.0	55° 52'.9 N
Alkaid	152° 59'.2	49° 14'.6 N
Alnair	27° 43'.4	46° 53'.7 S
Alnilam	275° 45'.8	1° 11'.7 S
Alphard	217° 55'.8	8° 43'.2 S
Alphecca	126° 11'.2	26° 40'.2 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.7 N
Atria	107° 28'.3	69° 03'.0 S
Avior	234° 17'.6	59° 33'.1 S
Bellatrix	278° 31'.4	6° 21'.6 N
Betelgeuse	271° 00'.7	7° 24'.4 N
Canopus	263° 55'.6	52° 42'.1 S
Capella	280° 33'.6	46° 00'.5 N
Deneb	49° 31'.4	45° 20'.2 N
Denebola	182° 33'.6	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.7	61° 40'.2 N
Elnath	278° 11'.9	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.6 N
Enif	33° 46'.8	9° 56'.6 N
Fomalhaut	15° 23'.6	29° 32'.9 S
Gacrux	172° 00'.9	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.0 S
Hadar	148° 48'.0	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.3	74° 05'.9 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.1 S
Miaplacidus	221° 39'.4	69° 46'.3 S
Mirfak	308° 39'.4	49° 54'.6 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.1	56° 41'.4 S
Polaris	317° 10'.2	89° 19'.4 N
Pollux	243° 27'.2	27° 59'.3 N
Procyon	244° 59'.3	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.3	11° 53'.8 N
Rigel	281° 11'.5	8° 11'.2 S
Rigil Kent	139° 51'.9	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.2	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.2 S
Vega	80° 39'.1	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	78° 57'.8	15:03
Mars	190° 08'.2	07:38
Jupiter	247° 57'.2	03:47
Saturn	136° 27'.2	11:12

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP	Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 15	Moonrise 16	Moonrise 17
183° 51'.8	18° 27'.9 S	34° 23'.8	11'.9	9° 55'.0 N	9'.5	56'.6	N 72°	07:03	08:40	-	13:28	13:15	12:50
198° 51'.7	28'.5	48° 54'.7	11'.9	10° 04'.5 N	9'.3	56'.5	N 70°	06:53	08:16	09:57	13:48	13:47	13:47
213° 51'.6	29'.1	63° 25'.6	12'.0	13'.8	9'.3		68°	06:44	07:58	09:18	14:04	14:10	14:22
228° 51'.5	29'.8	77° 56'.6	11'.9	23'.1	9'.2		66°	06:37	07:43	08:51	14:17	14:29	14:46
243° 51'.4	30'.4	92° 27'.5	11'.9	32'.3	9'.2		64°	06:30	07:31	08:31	14:28	14:44	15:06
258° 51'.3	31'.0	106° 58'.4	11'.8	41'.5	9'.1		62°	06:24	07:20	08:14	14:37	14:56	15:22
							60°	06:19	07:11	08:01	14:45	15:07	15:35
273° 51'.2	31'.7	121° 29'.2	11'.9	50'.6	9'.1	56'.4	N 58°	06:15	07:03	07:49	14:52	15:16	15:47
288° 51'.1	32'.3	136° 00'.1	11'.9	59'.7	9'.0		56°	06:10	06:56	07:39	14:58	15:25	15:57
303° 51'.0	33'.0	150° 31'.0	11'.8	11° 08'.7 N	8'.9		54°	06:06	06:50	07:30	15:03	15:32	16:05
318° 50'.9	33'.6	165° 01'.8	11'.9	17'.6	8'.9		52°	06:03	06:44	07:22	15:08	15:39	16:13
333° 50'.8	34'.2	179° 32'.7	11'.8	26'.5	8'.8		50°	05:59	06:39	07:15	15:13	15:45	16:20
348° 50'.7	34'.9	194° 03'.5	11'.8	35'.3	8'.8	56'.3	45°	05:52	06:27	06:59	15:23	15:57	16:36
3° 50'.6	18° 35'.5 S	208° 34'.3	11'.8	11° 44'.1 N	8'.7	56'.3	N 40°	05:44	06:17	06:46	15:31	16:08	16:48
18° 50'.5	36'.1	223° 05'.1	11'.8	52'.8	8'.6		35°	05:38	06:08	06:35	15:38	16:17	16:59
33° 50'.4	36'.7	237° 35'.9	11'.8	12° 01'.4 N	8'.6		30°	05:32	06:01	06:26	15:45	16:25	17:08
48° 50'.2	37'.4	252° 06'.7	11'.7	10'.0	8'.4		20°	05:19	05:46	06:09	15:56	16:39	17:25
63° 50'.1	38'.0	266° 37'.4	11'.8	18'.4	8'.5	56'.2	N 10°	05:07	05:33	05:55	16:05	16:52	17:39
78° 50'.0	38'.6	281° 08'.2	11'.7	26'.9	8'.3		0°	04:54	05:19	05:41	16:14	17:03	17:52
93° 49'.9	39'.3	295° 38'.9	11'.7	35'.2	8'.3		S 10°	04:39	05:05	05:27	16:24	17:15	18:06
108° 49'.8	39'.9	310° 09'.6	11'.8	43'.5	8'.3		20°	04:21	04:49	05:13	16:33	17:27	18:20
123° 49'.7	40'.5	324° 40'.4	11'.6	51'.8	8'.1		30°	03:58	04:29	04:55	16:45	17:41	18:37
138° 49'.6	41'.1	339° 11'.0	11'.7	59'.9	8'.1	56'.1	35°	03:43	04:17	04:45	16:51	17:50	18:46
153° 49'.5	41'.8	353° 41'.7	11'.7	13° 08'.0 N	8'.0		40°	03:25	04:03	04:34	16:59	17:59	18:57
168° 49'.4	42'.4	8° 12'.4	11'.6	16'.0	8'.0		45°	03:03	03:46	04:20	17:07	18:10	19:10
183° 49'.3	18° 43'.0 S	22° 43'.0	11'.7	13° 24'.0 N	7'.8	56'.1	S 50°	02:32	03:24	04:03	17:18	18:24	19:26
198° 49'.1	43'.6	37° 13'.7	11'.6	31'.8	7'.8		52°	02:16	03:13	03:55	17:23	18:30	19:34
213° 49'.0	44'.3	51° 44'.3	11'.6	39'.6	7'.8	56'.0	54°	01:56	03:01	03:46	17:28	18:37	19:42
228° 48'.9	44'.9	66° 14'.9	11'.6	47'.4	7'.6		56°	01:31	02:47	03:36	17:34	18:45	19:51
243° 48'.8	45'.5	80° 45'.5	11'.6	55'.0	7'.6		58°	00:52	02:30	03:25	17:41	18:54	20:02
258° 48'.7	46'.1	95° 16'.1	11'.6	14° 02'.6 N	7'.5		S 60°	-	02:09	03:12	17:49	19:04	20:14
273° 48'.6	46'.8	109° 46'.7	11'.5	10'.1	7'.4		S 62°	-	01:42	02:56	17:58	19:16	20:28
288° 48'.5	47'.4	124° 17'.2	11'.6	17'.5	7'.4	55'.9							
303° 48'.3	48'.0	138° 47'.8	11'.5	24'.9	7'.3								
318° 48'.2	48'.6	153° 18'.3	11'.5	32'.2	7'.2								
333° 48'.1	49'.2	167° 48'.8	11'.5	39'.4	7'.1								
348° 48'.0	49'.9	182° 19'.3	11'.5	46'.5	7'.1								
3° 47'.9	18° 50'.5 S	196° 49'.8	11'.5	14° 53'.6 N	6'.9	55'.8							
18° 47'.8	51'.1	211° 20'.3	11'.4	15° 00'.5 N	6'.9								
33° 47'.7	51'.7	225° 50'.7	11'.5	07'.4	6'.8								
48° 47'.5	52'.3	240° 21'.2	11'.4	14'.2	6'.8								
63° 47'.4	52'.9	254° 51'.6	11'.4	21'.0	6'.6								
78° 47'.3	53'.6	269° 22'.0	11'.4	27'.6	6'.6								
93° 47'.2	54'.2	283° 52'.4	11'.4	34'.2	6'.5	55'.7							
108° 47'.1	54'.8	298° 22'.8	11'.4	40'.7	6'.4								
123° 46'.9	55'.4	312° 53'.2	11'.4	47'.1	6'.3								
138° 46'.8	56'.0	327° 23'.6	11'.3	53'.4	6'.2								
153° 46'.7	56'.6	341° 53'.9	11'.4	59'.6	6'.2								
168° 46'.6	57'.2	356° 24'.3	11'.3	16° 05'.8 N	6'.1	55'.6							
183° 46'.5	18° 57'.8 S	10° 54'.6	11'.3	16° 11'.9 N	6'.0	55'.6							
198° 46'.3	58'.5	25° 24'.9	11'.4	17'.9	5'.9								
213° 46'.2	59'.1	39° 55'.3	11'.3	23'.8	5'.8								
228° 46'.1	59'.7	54° 25'.6	11'.3	29'.6	5'.7								
243° 46'.0	19° 00'.3 S	68° 55'.9	11'.2	35'.3	5'.7	55'.5							
258° 45'.9	00'.9	83° 26'.1	11'.3	41'.0	5'.5								
273° 45'.7	01'.5	97° 56'.4	11'.3	46'.5	5'.5								
288° 45'.6	02'.1	112° 26'.7	11'.2	52'.0	5'.4								
303° 45'.5	02'.7	126° 56'.9	11'.2	57'.4	5'.3								
318° 45'.4	03'.3	141° 27'.1	11'.3	17° 02'.7 N	5'.2	55'.4							
333° 45'.2	03'.9	155° 57'.4	11'.2	07'.9	5'.1								
348° 45'.1	04'.5	170° 27'.6	11'.2	13'.0	5'.1								
3° 45'.0	19° 05'.1 S	184° 57'.8	11'.2	17° 18'.1 N	4'.9	55'.4							
18° 44'.9	05'.7	199° 28'.0	11'.2	23'.0	4'.9								
33° 44'.7	06'.3	213° 58'.2	11'.2	27'.9	4'.7								
48° 44'.6	06'.9	228° 28'.4	11'.2	32'.6	4'.7	55'.3							
63° 44'.5	07'.5	242° 58'.6	11'.2	37'.3	4'.6								
78° 44'.4	08'.1	257° 28'.8	11'.2	41'.9	4'.5								
93° 44'.2	08'.7	271° 59'.0	11'.1	46'.4	4'.4								
108° 44'.1	09'.3	286° 29'.1	11'.2	50'.8	4'.3								
123° 44'.0	09'.9	300° 59'.3	11'.1	55'.1	4'.2	55'.2							
138° 43'.9	10'.5	315° 29'.4	11'.2	59'.3	4'.2								
153° 43'.7	11'.1	329° 59'.6	11'.1	18° 03'.5 N	4'.0								
168° 43'.6	11'.7	344° 29'.7	11'.2	07'.5	4'.0								
SD 16'.2	d 0'.6	SD	15'.3	15'.2	15'.1								

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 15	Moonset 16	Moonset 17
N 72°	-	14:49	16:25	06:18	08:12	10:20
N 70°	13:32	15:13	16:36	05:59	07:41	09:23
68°	14:11	15:31	16:44	05:45	07:19	08:49
66°	14:37	15:46	16:52	05:33	07:01	08:25
64°	14:58	15:58	16:59	05:23	06:47	08:06
62°	15:14	16:09	17:04	05:15	06:35	07:51
60°	15:28	16:18	17:10	05:08	06:25	07:38
N 58°	15:40	16:26	17:14	05:02	06:16	07:27
56°	15:50	16:33	17:19	04:56	06:08	07:17
54°	15:59	16:39	17:23	04:51	06:01	07:08
52°	16:07	16:45	17:26	04:47	05:55	07:01
50°	16:15	16:50	17:30	04:43	05:50	06:54
45°	16:30	17:02	17:38	04:34	05:38	06:39
N 40°	16:43	17:12	17:45	04:27	05:28	06:27
35°	16:54	17:21	17:51	04:20	05:19	06:17
30°	17:03	17:29	17:58	04:15	05:12	06:08
20°	17:20	17:43	18:10	04:05	04:59	05:53
N 10°	17:35	17:57	18:22	03:57	04:48	05:39
0°	17:48	18:10	18:36	03:49	04:38	05:27
S 10°	18:02	18:25	18:51	03:42	04:27	05:14
20°	18:17	18:41	19:09	03:33	04:16	05:01
30°	18:35	19:01	19:32	03:24	04:04	04:45
35°	18:45	19:13	19:47	03:19	03:56	04:37
40°	18:57	19:27	20:05	03:13	03:48	04:26
45°	19:10	19:45	20:28	03:05	03:38	04:15
S 50°	19:27	20:07	20:59	02:57	03:27	04:00
52°	19:35	20:18	21:16	02:53	03:21	03:54
54°	19:44	20:30	21:36	02:49	03:15	03:46
56°	19:54	20:45	22:03	02:44	03:09	03:38
58°	20:06	21:02	22:44	02:39	03:02	03:29
S 60°	20:19	21:23	-	02:33	02:53	03:18
S 62°	20:36	21:52	-	02:26	02:44	03:06

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
15	15 28	15 22	11:45	22:26	10:02	12d 95%
16	15 17	15 12	11:45	23:15	10:50	13d 99%
17	15 06	15 00	11:45	24:04	11:39	14d Full

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2013 November 18, 19, 20 (Mon, Tue, Wed)

GMT	ARIES	VENUS -4.6		MARS +1.3		JUPITER -2.5		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
18 Monday 00	57° 12'.1	134° 14'.8	26° 33'.9 S	246° 18'.3	5° 47'.4 N	305° 13'.4	21° 55'.1 N	193° 25'.2	14° 29'.2 S
01	72° 14'.6	149° 15'.0	33'.7	261° 19'.5	46'.8	320° 16'.0	55'.1	208° 27'.3	29'.3
02	87° 17'.1	164° 15'.1	33'.4	276° 20'.6	46'.3	335° 18'.5	55'.1	223° 29'.5	29'.4
03	102° 19'.5	179° 15'.2	33'.2	291° 21'.8	45'.8	350° 21'.1	55'.1	238° 31'.7	29'.5
04	117° 22'.0	194° 15'.3	32'.9	306° 23'.0	45'.3	5° 23'.6	55'.1	253° 33'.9	29'.5
05	132° 24'.5	209° 15'.4	32'.6	321° 24'.2	44'.7	20° 26'.2	55'.2	268° 36'.0	29'.6
06	147° 26'.9	224° 15'.5	32'.4	336° 25'.3	44'.2	35° 28'.8	55'.2	283° 38'.2	29'.7
07	162° 29'.4	239° 15'.6	32'.1	351° 26'.5	43'.7	50° 31'.3	55'.2	298° 40'.4	29'.8
08	177° 31'.8	254° 15'.7	31'.9	6° 27'.7	43'.2	65° 33'.9	55'.2	313° 42'.5	29'.9
09	192° 34'.3	269° 15'.8	31'.6	21° 28'.9	42'.7	80° 36'.4	55'.2	328° 44'.7	30'.0
10	207° 36'.8	284° 16'.0	31'.3	36° 30'.1	42'.1	95° 39'.0	55'.3	343° 46'.9	30'.0
11	222° 39'.2	299° 16'.1	31'.1	51° 31'.2	41'.6	110° 41'.6	55'.3	358° 49'.1	30'.1
12	237° 41'.7	314° 16'.2	26° 30'.8 S	66° 32'.4	5° 41'.1 N	125° 44'.1	21° 55'.3 N	13° 51'.2	14° 30'.2 S
13	252° 44'.2	329° 16'.3	30'.5	81° 33'.6	40'.6	140° 46'.7	55'.3	28° 53'.4	30'.3
14	267° 46'.6	344° 16'.5	30'.3	96° 34'.8	40'.1	155° 49'.3	55'.3	43° 55'.6	30'.4
15	282° 49'.1	359° 16'.6	30'.0	111° 35'.9	39'.5	170° 51'.8	55'.4	58° 57'.7	30'.5
16	297° 51'.6	14° 16'.7	29'.7	126° 37'.1	39'.0	185° 54'.4	55'.4	73° 59'.9	30'.6
17	312° 54'.0	29° 16'.9	29'.5	141° 38'.3	38'.5	200° 57'.0	55'.4	89° 02'.1	30'.6
18	327° 56'.5	44° 17'.0	29'.2	156° 39'.5	38'.0	215° 59'.5	55'.4	104° 04'.2	30'.7
19	342° 59'.0	59° 17'.1	28'.9	171° 40'.7	37'.5	231° 02'.1	55'.4	119° 06'.4	30'.8
20	358° 01'.4	74° 17'.3	28'.7	186° 41'.8	36'.9	246° 04'.7	55'.5	134° 08'.6	30'.9
21	13° 03'.9	89° 17'.4	28'.4	201° 43'.0	36'.4	261° 07'.2	55'.5	149° 10'.8	31'.0
22	28° 06'.3	104° 17'.5	28'.1	216° 44'.2	35'.9	276° 09'.8	55'.5	164° 12'.9	31'.1
23	43° 08'.8	119° 17'.7	27'.8	231° 45'.4	35'.4	291° 12'.4	55'.5	179° 15'.1	31'.1
19 Tuesday 00	58° 11'.3	134° 17'.8	26° 27'.6 S	246° 46'.6	5° 34'.8 N	306° 14'.9	21° 55'.5 N	194° 17'.3	14° 31'.2 S
01	73° 13'.7	149° 18'.0	27'.3	261° 47'.7	34'.3	321° 17'.5	55'.6	209° 19'.4	31'.3
02	88° 16'.2	164° 18'.1	27'.0	276° 48'.9	33'.8	336° 20'.1	55'.6	224° 21'.6	31'.4
03	103° 18'.7	179° 18'.3	26'.7	291° 50'.1	33'.3	351° 22'.6	55'.6	239° 23'.8	31'.5
04	118° 21'.1	194° 18'.4	26'.5	306° 51'.3	32'.8	6° 25'.2	55'.6	254° 26'.0	31'.6
05	133° 23'.6	209° 18'.6	26'.2	321° 52'.5	32'.2	21° 27'.8	55'.6	269° 28'.1	31'.7
06	148° 26'.1	224° 18'.7	25'.9	336° 53'.6	31'.7	36° 30'.3	55'.7	284° 30'.3	31'.7
07	163° 28'.5	239° 18'.9	25'.6	351° 54'.8	31'.2	51° 32'.9	55'.7	299° 32'.5	31'.8
08	178° 31'.0	254° 19'.0	25'.3	6° 56'.0	30'.7	66° 35'.5	55'.7	314° 34'.6	31'.9
09	193° 33'.5	269° 19'.2	25'.1	21° 57'.2	30'.2	81° 38'.0	55'.7	329° 36'.8	32'.0
10	208° 35'.9	284° 19'.3	24'.8	36° 58'.4	29'.6	96° 40'.6	55'.7	344° 39'.0	32'.1
11	223° 38'.4	299° 19'.5	24'.5	51° 59'.6	29'.1	111° 43'.2	55'.8	359° 41'.2	32'.2
12	238° 40'.8	314° 19'.7	26° 24'.2 S	67° 00'.7	5° 28'.6 N	126° 45'.8	21° 55'.8 N	14° 43'.3	14° 32'.2 S
13	253° 43'.3	329° 19'.8	23'.9	82° 01'.9	28'.1	141° 48'.3	55'.8	29° 45'.5	32'.3
14	268° 45'.8	344° 20'.0	23'.6	97° 03'.1	27'.6	156° 50'.9	55'.8	44° 47'.7	32'.4
15	283° 48'.2	359° 20'.2	23'.4	112° 04'.3	27'.0	171° 53'.5	55'.8	59° 49'.8	32'.5
16	298° 50'.7	14° 20'.3	23'.1	127° 05'.5	26'.5	186° 56'.0	55'.9	74° 52'.0	32'.6
17	313° 53'.2	29° 20'.5	22'.8	142° 06'.6	26'.0	201° 58'.6	55'.9	89° 54'.2	32'.7
18	328° 55'.6	44° 20'.7	22'.5	157° 07'.8	25'.5	217° 01'.2	55'.9	104° 56'.4	32'.7
19	343° 58'.1	59° 20'.9	22'.2	172° 09'.0	25'.0	232° 03'.8	55'.9	119° 58'.5	32'.8
20	359° 00'.6	74° 21'.0	21'.9	187° 10'.2	24'.4	247° 06'.3	55'.9	135° 00'.7	32'.9
21	14° 03'.0	89° 21'.2	21'.6	202° 11'.4	23'.9	262° 08'.9	56'.0	150° 02'.9	33'.0
22	29° 05'.5	104° 21'.4	21'.3	217° 12'.6	23'.4	277° 11'.5	56'.0	165° 05'.0	33'.1
23	44° 07'.9	119° 21'.6	21'.0	232° 13'.8	22'.9	292° 14'.1	56'.0	180° 07'.2	33'.2
20 Wednesday 00	59° 10'.4	134° 21'.8	26° 20'.7 S	247° 14'.9	5° 22'.4 N	307° 16'.6	21° 56'.0 N	195° 09'.4	14° 33'.3 S
01	74° 12'.9	149° 21'.9	20'.4	262° 16'.1	21'.8	322° 19'.2	56'.0	210° 11'.5	33'.3
02	89° 15'.3	164° 22'.1	20'.2	277° 17'.3	21'.3	337° 21'.8	56'.1	225° 13'.7	33'.4
03	104° 17'.8	179° 22'.3	19'.9	292° 18'.5	20'.8	352° 24'.4	56'.1	240° 15'.9	33'.5
04	119° 20'.3	194° 22'.5	19'.6	307° 19'.7	20'.3	7° 26'.9	56'.1	255° 18'.1	33'.6
05	134° 22'.7	209° 22'.7	19'.3	322° 20'.9	19'.8	22° 29'.5	56'.1	270° 20'.2	33'.7
06	149° 25'.2	224° 22'.9	19'.0	337° 22'.0	19'.2	37° 32'.1	56'.2	285° 22'.4	33'.8
07	164° 27'.7	239° 23'.1	18'.7	352° 23'.2	18'.7	52° 34'.7	56'.2	300° 24'.6	33'.8
08	179° 30'.1	254° 23'.3	18'.4	7° 24'.4	18'.2	67° 37'.3	56'.2	315° 26'.7	33'.9
09	194° 32'.6	269° 23'.5	18'.1	22° 25'.6	17'.7	82° 39'.8	56'.2	330° 28'.9	34'.0
10	209° 35'.1	284° 23'.7	17'.8	37° 26'.8	17'.2	97° 42'.4	56'.2	345° 31'.1	34'.1
11	224° 37'.5	299° 23'.9	17'.5	52° 28'.0	16'.7	112° 45'.0	56'.3	0° 33'.3	34'.2
12	239° 40'.0	314° 24'.1	26° 17'.2 S	67° 29'.2	5° 16'.1 N	127° 47'.6	21° 56'.3 N	15° 35'.4	14° 34'.3 S
13	254° 42'.4	329° 24'.3	16'.9	82° 30'.4	15'.6	142° 50'.2	56'.3	30° 37'.6	34'.3
14	269° 44'.9	344° 24'.5	16'.6	97° 31'.5	15'.1	157° 52'.7	56'.3	45° 39'.8	34'.4
15	284° 47'.4	359° 24'.7	16'.2	112° 32'.7	14'.6	172° 55'.3	56'.3	60° 41'.9	34'.5
16	299° 49'.8	14° 24'.9	15'.9	127° 33'.9	14'.1	187° 57'.9	56'.4	75° 44'.1	34'.6
17	314° 52'.3	29° 25'.1	15'.6	142° 35'.1	13'.5	203° 00'.5	56'.4	90° 46'.3	34'.7
18	329° 54'.8	44° 25'.4	15'.3	157° 36'.3	13'.0	218° 03'.1	56'.4	105° 48'.5	34'.8
19	344° 57'.2	59° 25'.6	15'.0	172° 37'.5	12'.5	233° 05'.6	56'.4	120° 50'.6	34'.8
20	359° 59'.7	74° 25'.8	14'.7	187° 38'.7	12'.0	248° 08'.2	56'.5	135° 52'.8	34'.9
21	15° 02'.2	89° 26'.0	14'.4	202° 39'.9	11'.5	263° 10'.8	56'.5	150° 55'.0	35'.0
22	30° 04'.6	104° 26'.2	14'.1	217° 41'.0	10'.9	278° 13'.4	56'.5	165° 57'.2	35'.1
23	45° 07'.1	119° 26'.5	13'.8	232° 42'.2	10'.4	293° 16'.0	56'.5	180° 59'.3	35'.2
	M.P. 20:04	v 0'.2	d 0'.3	v 1'.2	d 0'.5	v 2'.6	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.7	40° 15'.0 S
Achernar	335° 26'.1	57° 10'.1 S
Acrux	173° 09'.3	63° 10'.3 S
Adhara	255° 12'.0	28° 59'.5 S
Aldebaran	290° 48'.7	16° 32'.1 N
Alioth	166° 20'.9	55° 52'.9 N
Alkaid	152° 59'.2	49° 14'.6 N
Alnair	27° 43'.4	46° 53'.7 S
Alnilam	275° 45'.8	1° 11'.7 S
Alphard	217° 55'.8	8° 43'.2 S
Alphecca	126° 11'.2	26° 40'.2 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.7 N
Atria	107° 28'.3	69° 03'.0 S
Avior	234° 17'.6	59° 33'.1 S
Bellatrix	278° 31'.4	6° 21'.6 N
Betelgeuse	271° 00'.7	7° 24'.4 N
Canopus	263° 55'.6	52° 42'.2 S
Capella	280° 33'.6	46° 00'.5 N
Deneb	49° 31'.4	45° 20'.2 N
Denebola	182° 33'.5	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.7	61° 40'.2 N
Elnath	278° 11'.9	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.6 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.6	29° 32'.9 S
Gacrux	172° 00'.9	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.0 S
Hadar	148° 48'.0	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.3	74° 05'.9 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.6	36° 26'.1 S
Miaplacidus	221° 39'.3	69° 46'.3 S
Mirfak	308° 39'.4	49° 54'.6 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.1	56° 41'.4 S
Polaris	317° 10'.1	89° 19'.5 N
Pollux	243° 27'.2	27° 59'.3 N
Procyon	244° 59'.2	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.2	11° 53'.8 N
Rigel	281° 11'.5	8° 11'.2 S
Rigil Kent	139° 51'.9	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.2	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.2 S
Vega	80° 39'.1	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	76° 06'.5	15:03
Mars	188° 35'.3	07:32
Jupiter	248° 03'.6	03:34
Saturn	136° 06'.0	11:01

SUN				MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 43'.5	19° 12'.3 S	358° 59'.9	11'.1	18° 11'.5 N	3'.8	55'.2
198° 43'.3	12'.9	13° 30'.0	11'.2	15'.3	3'.8	
213° 43'.2	13'.5	28° 00'.2	11'.1	19'.1	3'.6	55'.1
228° 43'.1	14'.1	42° 30'.3	11'.1	22'.7	3'.6	
243° 43'.0	14'.7	57° 00'.4	11'.2	26'.3	3'.5	
258° 42'.8	15'.3	71° 30'.6	11'.1	29'.8	3'.4	
273° 42'.7	15'.9	86° 00'.7	11'.1	33'.2	3'.3	
288° 42'.6	16'.5	100° 30'.8	11'.2	36'.5	3'.2	
303° 42'.4	17'.1	115° 01'.0	11'.1	39'.7	3'.1	55'.0
318° 42'.3	17'.7	129° 31'.1	11'.1	42'.8	3'.0	
333° 42'.2	18'.3	144° 01'.2	11'.2	45'.8	2'.9	
348° 42'.0	18'.9	158° 31'.4	11'.1	48'.7	2'.8	
3° 41'.9	19° 19'.5 S	173° 01'.5	11'.2	18° 51'.5 N	2'.8	55'.0
18° 41'.8	20'.0	187° 31'.7	11'.1	54'.3	2'.6	
33° 41'.6	20'.6	202° 01'.8	11'.1	56'.9	2'.5	54'.9
48° 41'.5	21'.2	216° 31'.9	11'.2	59'.4	2'.5	
63° 41'.4	21'.8	231° 02'.1	11'.2	19° 01'.9 N	2'.3	
78° 41'.2	22'.4	245° 32'.3	11'.1	04'.2	2'.3	
93° 41'.1	23'.0	260° 02'.4	11'.2	06'.5	2'.1	
108° 41'.0	23'.6	274° 32'.6	11'.2	08'.6	2'.1	
123° 40'.8	24'.1	289° 02'.8	11'.1	10'.7	2'.0	54'.8
138° 40'.7	24'.7	303° 32'.9	11'.2	12'.7	1'.9	
153° 40'.5	25'.3	318° 03'.1	11'.2	14'.6	1'.7	
168° 40'.4	25'.9	332° 33'.3	11'.2	16'.3	1'.7	
183° 40'.3	19° 26'.5 S	347° 03'.5	11'.2	19° 18'.0 N	1'.6	54'.8
198° 40'.1	27'.1	1° 33'.7	11'.2	19'.6	1'.5	
213° 40'.0	27'.6	16° 03'.9	11'.3	21'.1	1'.4	
228° 39'.9	28'.2	30° 34'.2	11'.2	22'.5	1'.3	54'.7
243° 39'.7	28'.8	45° 04'.4	11'.3	23'.8	1'.2	
258° 39'.6	29'.4	59° 34'.7	11'.2	25'.0	1'.1	
273° 39'.4	30'.0	74° 04'.9	11'.3	26'.1	1'.0	
288° 39'.3	30'.5	88° 35'.2	11'.3	27'.1	1'.0	
303° 39'.2	31'.1	103° 05'.5	11'.3	28'.1	0'.8	
318° 39'.0	31'.7	117° 35'.8	11'.3	28'.9	0'.7	
333° 38'.9	32'.3	132° 06'.1	11'.3	29'.6	0'.7	54'.6
348° 38'.7	32'.8	146° 36'.4	11'.4	30'.3	0'.5	
3° 38'.6	19° 33'.4 S	161° 06'.8	11'.3	19° 30'.8 N	0'.4	54'.6
18° 38'.5	34'.0	175° 37'.1	11'.4	31'.2	0'.4	
33° 38'.3	34'.6	190° 07'.5	11'.4	31'.6	0'.3	
48° 38'.2	35'.1	204° 37'.9	11'.4	31'.9	0'.1	
63° 38'.0	35'.7	219° 08'.3	11'.4	32'.0	0'.1	
78° 37'.9	36'.3	233° 38'.7	11'.4	32'.1	0'.0	54'.5
93° 37'.7	36'.9	248° 09'.1	11'.5	32'.1	0'.1	
108° 37'.6	37'.4	262° 39'.6	11'.4	32'.0	0'.3	
123° 37'.4	38'.0	277° 10'.0	11'.5	31'.7	0'.3	
138° 37'.3	38'.6	291° 40'.5	11'.5	31'.4	0'.4	
153° 37'.2	39'.1	306° 11'.0	11'.6	31'.0	0'.4	
168° 37'.0	39'.7	320° 41'.6	11'.5	30'.6	0'.6	
183° 36'.9	19° 40'.3 S	335° 12'.1	11'.6	19° 30'.0 N	0'.7	54'.5
198° 36'.7	40'.8	349° 42'.7	11'.6	29'.3	0'.8	54'.4
213° 36'.6	41'.4	4° 13'.3	11'.6	28'.5	0'.8	
228° 36'.4	42'.0	18° 43'.9	11'.6	27'.7	1'.0	
243° 36'.3	42'.5	33° 14'.5	11'.7	26'.7	1'.0	
258° 36'.1	43'.1	47° 45'.2	11'.7	25'.7	1'.2	
273° 36'.0	43'.7	62° 15'.9	11'.7	24'.5	1'.2	
288° 35'.8	44'.2	76° 46'.6	11'.7	23'.3	1'.3	
303° 35'.7	44'.8	91° 17'.3	11'.7	22'.0	1'.4	
318° 35'.5	45'.4	105° 48'.0	11'.8	20'.6	1'.5	
333° 35'.4	45'.9	120° 18'.8	11'.8	19'.1	1'.6	54'.3
348° 35'.2	46'.5	134° 49'.6	11'.8	17'.5	1'.7	
3° 35'.1	19° 47'.0 S	149° 20'.4	11'.9	19° 15'.8 N	1'.8	54'.3
18° 34'.9	47'.6	163° 51'.3	11'.8	14'.0	1'.8	
33° 34'.8	48'.2	178° 22'.1	11'.9	12'.2	2'.0	
48° 34'.6	48'.7	192° 53'.0	12'.0	10'.2	2'.0	
63° 34'.5	49'.3	207° 24'.0	11'.9	08'.2	2'.1	
78° 34'.3	49'.8	221° 54'.9	12'.0	06'.1	2'.2	
93° 34'.2	50'.4	236° 25'.9	12'.0	03'.9	2'.3	
108° 34'.0	50'.9	250° 56'.9	12'.0	01'.6	2'.4	
123° 33'.9	51'.5	265° 27'.9	12'.1	18° 59'.2 N	2'.5	54'.2
138° 33'.7	52'.1	279° 59'.0	12'.1	56'.7	2'.6	
153° 33'.6	52'.6	294° 30'.1	12'.1	54'.1	2'.6	
168° 33'.4	53'.2	309° 01'.2	12'.1	51'.5	2'.8	
SD 16'.2	d 0'.6	SD	15'.0	14'.9	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20
N 72°	07:14	08:54	-	-	-	-
N 70°	07:02	08:28	10:19	13:53	14:17	15:22
68°	06:52	08:08	09:33	14:42	15:19	16:16
66°	06:44	07:52	09:03	15:13	15:54	16:49
64°	06:37	07:38	08:41	15:37	16:19	17:13
62°	06:31	07:27	08:23	15:55	16:38	17:32
60°	06:25	07:18	08:08	16:10	16:55	17:48
N 58°	06:20	07:09	07:56	16:23	17:08	18:01
56°	06:15	07:02	07:45	16:35	17:20	18:12
54°	06:11	06:55	07:35	16:45	17:30	18:22
52°	06:07	06:49	07:27	16:53	17:39	18:31
50°	06:03	06:43	07:19	17:01	17:48	18:39
45°	05:55	06:31	07:03	17:18	18:05	18:56
N 40°	05:47	06:20	06:50	17:32	18:19	19:10
35°	05:40	06:11	06:38	17:44	18:31	19:22
30°	05:34	06:03	06:28	17:54	18:42	19:32
20°	05:21	05:48	06:11	18:12	19:00	19:49
N 10°	05:08	05:34	05:56	18:27	19:16	20:05
0°	04:54	05:20	05:42	18:42	19:31	20:19
S 10°	04:39	05:05	05:27	18:56	19:46	20:34
20°	04:20	04:48	05:12	19:12	20:01	20:49
30°	03:56	04:28	04:54	19:30	20:20	21:06
35°	03:41	04:15	04:44	19:40	20:30	21:17
40°	03:22	04:01	04:31	19:52	20:43	21:28
45°	02:58	03:43	04:17	20:06	20:57	21:42
S 50°	02:26	03:20	04:00	20:23	21:14	21:59
52°	02:09	03:08	03:51	20:31	21:23	22:07
54°	01:47	02:55	03:42	20:41	21:32	22:16
56°	01:19	02:40	03:31	20:51	21:42	22:25
58°	00:30	02:22	03:19	21:02	21:54	22:37
S 60°	-	01:59	03:05	21:16	22:08	22:50
S 62°	-	01:28	02:48	21:32	22:24	23:05

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 18	Moonset 19	Moonset 20
N 72°	-	14:36	16:16	-	-	-
N 70°	13:11	15:02	16:28	11:00	12:19	12:54
68°	13:57	15:22	16:37	10:11	11:17	12:00
66°	14:27	15:38	16:46	09:40	10:42	11:27
64°	14:50	15:52	16:53	09:17	10:17	11:03
62°	15:07	16:03	16:59	08:59	09:57	10:44
60°	15:22	16:12	17:05	08:44	09:41	10:28
N 58°	15:35	16:21	17:10	08:31	09:28	10:15
56°	15:45	16:29	17:15	08:20	09:16	10:03
54°	15:55	16:35	17:19	08:10	09:06	09:53
52°	16:03	16:41	17:23	08:02	08:56	09:44
50°	16:11	16:47	17:27	07:54	08:48	09:36
45°	16:27	16:59	17:35	07:37	08:31	09:19
N 40°	16:41	17:10	17:43	07:24	08:17	09:05
35°	16:52	17:19	17:50	07:12	08:05	08:53
30°	17:02	17:28	17:57	07:02	07:54	08:43
20°	17:19	17:43	18:10	06:45	07:36	08:25
N 10°	17:35	17:57	18:23	06:30	07:20	08:09
0°	17:49	18:11	18:36	06:16	07:05	07:54
S 10°	18:03	18:26	18:52	06:02	06:51	07:40
20°	18:19	18:43	19:11	05:47	06:35	07:24
30°	18:37	19:04	19:35	05:30	06:17	07:06
35°	18:48	19:16	19:51	05:20	06:06	06:55
40°	19:00	19:31	20:09	05:08	05:54	06:43
45°	19:14	19:49	20:33	04:55	05:40	06:29
S 50°	19:32	20:12	21:07	04:39	05:22	06:11
52°	19:41	20:24	21:24	04:31	05:14	06:03
54°	19:50	20:37	21:46	04:22	05:05	05:54
56°	20:01	20:52	22:16	04:13	04:55	05:44
58°	20:13	21:11	23:11	04:02	04:43	05:32
S 60°	20:27	21:34	-	03:50	04:29	05:18
S 62°	20:45	22:06	-	03:35	04:13	05:02

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
18	14 54	14 48	11:45	00:04	12:29	15d 99%
19	14 41	14 35	11:45	00:54	13:18	16d 97%
20	14 28	14 21	11:46	01:43	14:07	17d 92%

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2013 November 21, 22, 23 (Thur, Fri, Sat)

GMT	ARIES	VENUS -4.6		MARS +1.3		JUPITER -2.5		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
21 Thursday 00	60° 09'.6	134° 26'.7	26° 13'.5 S	247° 43'.4	5° 09'.9 N	308° 18'.6	21° 56'.5 N	196° 01'.5	14° 35'.3 S
01	75° 12'.0	149° 26'.9	13'.1	262° 44'.6	09'.4	323° 21'.2	56'.6	211° 03'.7	35'.3
02	90° 14'.5	164° 27'.1	12'.8	277° 45'.8	08'.9	338° 23'.7	56'.6	226° 05'.8	35'.4
03	105° 16'.9	179° 27'.4	12'.5	292° 47'.0	08'.3	353° 26'.3	56'.6	241° 08'.0	35'.5
04	120° 19'.4	194° 27'.6	12'.2	307° 48'.2	07'.8	8° 28'.9	56'.6	256° 10'.2	35'.6
05	135° 21'.9	209° 27'.8	11'.9	322° 49'.4	07'.3	23° 31'.5	56'.7	271° 12'.4	35'.7
06	150° 24'.3	224° 28'.1	11'.6	337° 50'.6	06'.8	38° 34'.1	56'.7	286° 14'.5	35'.8
07	165° 26'.8	239° 28'.3	11'.3	352° 51'.8	06'.3	53° 36'.7	56'.7	301° 16'.7	35'.8
08	180° 29'.3	254° 28'.6	10'.9	7° 52'.9	05'.8	68° 39'.3	56'.7	316° 18'.9	35'.9
09	195° 31'.7	269° 28'.8	10'.6	22° 54'.1	05'.2	83° 41'.8	56'.8	331° 21'.0	36'.0
10	210° 34'.2	284° 29'.1	10'.3	37° 55'.3	04'.7	98° 44'.4	56'.8	346° 23'.2	36'.1
11	225° 36'.7	299° 29'.3	10'.0	52° 56'.5	04'.2	113° 47'.0	56'.8	1° 25'.4	36'.2
12	240° 39'.1	314° 29'.5	26° 09'.7 S	67° 57'.7	5° 03'.7 N	128° 49'.6	21° 56'.8 N	16° 27'.6	14° 36'.3 S
13	255° 41'.6	329° 29'.8	09'.3	82° 58'.9	03'.2	143° 52'.2	56'.8	31° 29'.7	36'.3
14	270° 44'.1	344° 30'.0	09'.0	98° 00'.1	02'.6	158° 54'.8	56'.9	46° 31'.9	36'.4
15	285° 46'.5	359° 30'.3	08'.7	113° 01'.3	02'.1	173° 57'.4	56'.9	61° 34'.1	36'.5
16	300° 49'.0	14° 30'.6	08'.4	128° 02'.5	01'.6	189° 00'.0	56'.9	76° 36'.2	36'.6
17	315° 51'.4	29° 30'.8	08'.0	143° 03'.7	01'.1	204° 02'.6	56'.9	91° 38'.4	36'.7
18	330° 53'.9	44° 31'.1	07'.7	158° 04'.9	00'.6	219° 05'.1	57'.0	106° 40'.6	36'.8
19	345° 56'.4	59° 31'.3	07'.4	173° 06'.1	00'.1	234° 07'.7	57'.0	121° 42'.8	36'.8
20	0° 58'.8	74° 31'.6	07'.1	188° 07'.2	4° 59'.5 N	249° 10'.3	57'.0	136° 44'.9	36'.9
21	16° 01'.3	89° 31'.9	06'.7	203° 08'.4	59'.0	264° 12'.9	57'.0	151° 47'.1	37'.0
22	31° 03'.8	104° 32'.1	06'.4	218° 09'.6	58'.5	279° 15'.5	57'.1	166° 49'.3	37'.1
23	46° 06'.2	119° 32'.4	06'.1	233° 10'.8	58'.0	294° 18'.1	57'.1	181° 51'.5	37'.2
22 Friday 00	61° 08'.7	134° 32'.7	26° 05'.7 S	248° 12'.0	4° 57'.5 N	309° 20'.7	21° 57'.1 N	196° 53'.6	14° 37'.3 S
01	76° 11'.2	149° 32'.9	05'.4	263° 13'.2	57'.0	324° 23'.3	57'.1	211° 55'.8	37'.3
02	91° 13'.6	164° 33'.2	05'.1	278° 14'.4	56'.4	339° 25'.9	57'.1	226° 58'.0	37'.4
03	106° 16'.1	179° 33'.5	04'.7	293° 15'.6	55'.9	354° 28'.5	57'.2	242° 00'.1	37'.5
04	121° 18'.6	194° 33'.8	04'.4	308° 16'.8	55'.4	9° 31'.1	57'.2	257° 02'.3	37'.6
05	136° 21'.0	209° 34'.0	04'.1	323° 18'.0	54'.9	24° 33'.7	57'.2	272° 04'.5	37'.7
06	151° 23'.5	224° 34'.3	03'.7	338° 19'.2	54'.4	39° 36'.3	57'.2	287° 06'.7	37'.8
07	166° 25'.9	239° 34'.6	03'.4	353° 20'.4	53'.8	54° 38'.9	57'.3	302° 08'.8	37'.8
08	181° 28'.4	254° 34'.9	03'.1	8° 21'.6	53'.3	69° 41'.5	57'.3	317° 11'.0	37'.9
09	196° 30'.9	269° 35'.2	02'.7	23° 22'.8	52'.8	84° 44'.1	57'.3	332° 13'.2	38'.0
10	211° 33'.3	284° 35'.5	02'.4	38° 24'.0	52'.3	99° 46'.7	57'.3	347° 15'.3	38'.1
11	226° 35'.8	299° 35'.8	02'.1	53° 25'.2	51'.8	114° 49'.3	57'.4	2° 17'.5	38'.2
12	241° 38'.3	314° 36'.1	26° 01'.7 S	68° 26'.4	4° 51'.3 N	129° 51'.8	21° 57'.4 N	17° 19'.7	14° 38'.3 S
13	256° 40'.7	329° 36'.4	01'.4	83° 27'.6	50'.7	144° 54'.4	57'.4	32° 21'.9	38'.3
14	271° 43'.2	344° 36'.6	01'.0	98° 28'.8	50'.2	159° 57'.0	57'.4	47° 24'.0	38'.4
15	286° 45'.7	359° 36'.9	00'.7	113° 29'.9	49'.7	174° 59'.6	57'.5	62° 26'.2	38'.5
16	301° 48'.1	14° 37'.2	00'.3	128° 31'.1	49'.2	190° 02'.2	57'.5	77° 28'.4	38'.6
17	316° 50'.6	29° 37'.5	00'.0	143° 32'.3	48'.7	205° 04'.8	57'.5	92° 30'.6	38'.7
18	331° 53'.0	44° 37'.9	25° 59'.7 S	158° 33'.5	48'.2	220° 07'.4	57'.5	107° 32'.7	38'.7
19	346° 55'.5	59° 38'.2	59'.3	173° 34'.7	47'.6	235° 10'.0	57'.6	122° 34'.9	38'.8
20	1° 58'.0	74° 38'.5	59'.0	188° 35'.9	47'.1	250° 12'.6	57'.6	137° 37'.1	38'.9
21	17° 00'.4	89° 38'.8	58'.6	203° 37'.1	46'.6	265° 15'.2	57'.6	152° 39'.3	39'.0
22	32° 02'.9	104° 39'.1	58'.3	218° 38'.3	46'.1	280° 17'.8	57'.6	167° 41'.4	39'.1
23	47° 05'.4	119° 39'.4	57'.9	233° 39'.5	45'.6	295° 20'.4	57'.7	182° 43'.6	39'.2
23 Saturday 00	62° 07'.8	134° 39'.7	25° 57'.6 S	248° 40'.7	4° 45'.1 N	310° 23'.0	21° 57'.7 N	197° 45'.8	14° 39'.2 S
01	77° 10'.3	149° 40'.0	57'.2	263° 41'.9	44'.5	325° 25'.6	57'.7	212° 47'.9	39'.3
02	92° 12'.8	164° 40'.4	56'.9	278° 43'.1	44'.0	340° 28'.2	57'.7	227° 50'.1	39'.4
03	107° 15'.2	179° 40'.7	56'.5	293° 44'.3	43'.5	355° 30'.9	57'.8	242° 52'.3	39'.5
04	122° 17'.7	194° 41'.0	56'.2	308° 45'.5	43'.0	10° 33'.5	57'.8	257° 54'.5	39'.6
05	137° 20'.2	209° 41'.3	55'.8	323° 46'.7	42'.5	25° 36'.1	57'.8	272° 56'.6	39'.7
06	152° 22'.6	224° 41'.7	55'.5	338° 47'.9	42'.0	40° 38'.7	57'.8	287° 58'.8	39'.7
07	167° 25'.1	239° 42'.0	55'.1	353° 49'.1	41'.5	55° 41'.3	57'.9	303° 01'.0	39'.8
08	182° 27'.5	254° 42'.3	54'.8	8° 50'.3	40'.9	70° 43'.9	57'.9	318° 03'.2	39'.9
09	197° 30'.0	269° 42'.7	54'.4	23° 51'.5	40'.4	85° 46'.5	57'.9	333° 05'.3	40'.0
10	212° 32'.5	284° 43'.0	54'.1	38° 52'.7	39'.9	100° 49'.1	57'.9	348° 07'.5	40'.1
11	227° 34'.9	299° 43'.3	53'.7	53° 53'.9	39'.4	115° 51'.7	58'.0	3° 09'.7	40'.1
12	242° 37'.4	314° 43'.7	25° 53'.4 S	68° 55'.1	4° 38'.9 N	130° 54'.3	21° 58'.0 N	18° 11'.8	14° 40'.2 S
13	257° 39'.9	329° 44'.0	53'.0	83° 56'.3	38'.4	145° 56'.9	58'.0	33° 14'.0	40'.3
14	272° 42'.3	344° 44'.4	52'.6	98° 57'.5	37'.8	160° 59'.5	58'.0	48° 16'.2	40'.4
15	287° 44'.8	359° 44'.7	52'.3	113° 58'.7	37'.3	176° 02'.1	58'.1	63° 18'.4	40'.5
16	302° 47'.3	14° 45'.0	51'.9	128° 59'.9	36'.8	191° 04'.7	58'.1	78° 20'.5	40'.6
17	317° 49'.7	29° 45'.4	51'.6	144° 01'.1	36'.3	206° 07'.3	58'.1	93° 22'.7	40'.6
18	332° 52'.2	44° 45'.7	51'.2	159° 02'.3	35'.8	221° 09'.9	58'.1	108° 24'.9	40'.7
19	347° 54'.7	59° 46'.1	50'.8	174° 03'.5	35'.3	236° 12'.5	58'.2	123° 27'.1	40'.8
20	2° 57'.1	74° 46'.5	50'.5	189° 04'.7	34'.7	251° 15'.2	58'.2	138° 29'.2	40'.9
21	17° 59'.6	89° 46'.8	50'.1	204° 05'.9	34'.2	266° 17'.8	58'.2	153° 31'.4	41'.0
22	33° 02'.0	104° 47'.2	49'.7	219° 07'.1	33'.7	281° 20'.4	58'.2	168° 33'.6	41'.1
23	48° 04'.5	119° 47'.5	49'.4	234° 08'.3	33'.2	296° 23'.0	58'.3	183° 35'.8	41'.1
	M.P. 19:52	v 0'.3	d 0'.3	v 1'.2	d 0'.5	v 2'.6	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.7	40° 15'.0 S
Achernar	335° 26'.1	57° 10'.1 S
Acrux	173° 09'.3	63° 10'.3 S
Adhara	255° 12'.0	28° 59'.5 S
Aldebaran	290° 48'.7	16° 32'.1 N
Alioth	166° 20'.9	55° 52'.9 N
Alkaid	152° 59'.1	49° 14'.6 N
Alnair	27° 43'.4	46° 53'.7 S
Alnilam	275° 45'.8	1° 11'.7 S
Alphard	217° 55'.7	8° 43'.2 S
Alphecca	126° 11'.2	26° 40'.2 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.2	42° 13'.9 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.7 N
Atria	107° 28'.3	69° 03'.0 S
Avior	234° 17'.5	59° 33'.1 S
Bellatrix	278° 31'.4	6° 21'.6 N
Betelgeuse	271° 00'.7	7° 24'.4 N
Canopus	263° 55'.5	52° 42'.2 S
Capella	280° 33'.5	46° 00'.5 N
Deneb	49° 31'.4	45° 20'.2 N
Denebola	182° 33'.5	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.6	61° 40'.2 N
Elnath	278° 11'.9	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.6 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.6	29° 32'.9 S
Gacrux	172° 00'.8	57° 11'.2 S
Gienah	175° 52'.2	17° 37'.0 S
Hadar	148° 48'.0	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.3	74° 05'.9 N
Markab	13° 37'.9	15° 17'.1 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.1 S
Miaplacidus	221° 39'.3	69° 46'.3 S
Mirfak	308° 39'.4	49° 54'.6 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.1	56° 41'.4 S
Polaris	317° 10'.2	89° 19'.5 N
Pollux	243° 27'.2	27° 59'.3 N
Procyon	244° 59'.2	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.2	11° 53'.8 N
Rigel	281° 11'.4	8° 11'.2 S
Rigil Kent	139° 51'.8	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.2	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.1	43° 29'.2 S
Vega	80° 39'.1	38° 48'.2 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	73° 24'.0	15:02
Mars	187° 03'.3	07:27
Jupiter	248° 12'.0	03:22
Saturn	135° 44'.9	10:51

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 33'.3	19° 53'.7 S	323° 32'.3	12'.2	18° 48'.7 N	2'.8	54'.2
198° 33'.1	54'.3	338° 03'.5	12'.2	45'.9	2'.9	
213° 32'.9	54'.8	352° 34'.7	12'.3	43'.0	3'.0	
228° 32'.8	55'.4	7° 06'.0	12'.2	40'.0	3'.1	
243° 32'.6	55'.9	21° 37'.2	12'.3	36'.9	3'.1	
258° 32'.5	56'.5	36° 08'.5	12'.3	33'.8	3'.3	
273° 32'.3	57'.0	50° 39'.8	12'.4	30'.5	3'.3	
288° 32'.2	57'.6	65° 11'.2	12'.4	27'.2	3'.4	
303° 32'.0	58'.1	79° 42'.6	12'.4	23'.8	3'.5	
318° 31'.8	58'.7	94° 14'.0	12'.4	20'.3	3'.6	
333° 31'.7	59'.2	108° 45'.4	12'.5	16'.7	3'.6	
348° 31'.5	59'.8	123° 16'.9	12'.5	13'.1	3'.8	54'.1
3° 31'.4	20° 00'.3 S	137° 48'.4	12'.5	18° 09'.3 N	3'.8	54'.1
18° 31'.2	00'.8	152° 19'.9	12'.6	05'.5	3'.9	
33° 31'.1	01'.4	166° 51'.5	12'.6	01'.6	4'.0	
48° 30'.9	01'.9	181° 23'.1	12'.6	17° 57'.6 N	4'.1	
63° 30'.7	02'.5	195° 54'.7	12'.7	53'.5	4'.1	
78° 30'.6	03'.0	210° 26'.4	12'.7	49'.4	4'.2	
93° 30'.4	03'.6	224° 58'.1	12'.7	45'.2	4'.3	
108° 30'.2	04'.1	239° 29'.8	12'.8	40'.9	4'.4	
123° 30'.1	04'.6	254° 01'.6	12'.8	36'.5	4'.5	
138° 29'.9	05'.2	268° 33'.4	12'.8	32'.0	4'.5	
153° 29'.8	05'.7	283° 05'.2	12'.8	27'.5	4'.6	
168° 29'.6	06'.3	297° 37'.0	12'.9	22'.9	4'.7	
183° 29'.4	20° 06'.8 S	312° 08'.9	12'.9	17° 18'.2 N	4'.8	54'.1
198° 29'.3	07'.3	326° 40'.8	13'.0	13'.4	4'.8	
213° 29'.1	07'.9	341° 12'.8	13'.0	08'.6	4'.9	
228° 28'.9	08'.4	355° 44'.8	13'.0	03'.7	5'.0	
243° 28'.8	08'.9	10° 16'.8	13'.0	16° 58'.7 N	5'.1	
258° 28'.6	09'.5	24° 48'.8	13'.1	53'.6	5'.1	
273° 28'.4	10'.0	39° 20'.9	13'.1	48'.5	5'.2	
288° 28'.3	10'.5	53° 53'.0	13'.1	43'.3	5'.3	
303° 28'.1	11'.1	68° 25'.1	13'.2	38'.0	5'.4	
318° 28'.0	11'.6	82° 57'.3	13'.2	32'.6	5'.4	
333° 27'.8	12'.1	97° 29'.5	13'.2	27'.2	5'.5	
348° 27'.6	12'.7	112° 01'.7	13'.3	21'.7	5'.6	
3° 27'.5	20° 13'.2 S	126° 34'.0	13'.3	16° 16'.1 N	5'.6	54'.1
18° 27'.3	13'.7	141° 06'.3	13'.3	10'.5	5'.7	
33° 27'.1	14'.3	155° 38'.6	13'.4	04'.8	5'.8	
48° 26'.9	14'.8	170° 11'.0	13'.3	15° 59'.0 N	5'.9	
63° 26'.8	15'.3	184° 43'.3	13'.5	53'.1	5'.9	
78° 26'.6	15'.8	199° 15'.8	13'.4	47'.2	6'.0	
93° 26'.4	16'.4	213° 48'.2	13'.5	41'.2	6'.1	
108° 26'.3	16'.9	228° 20'.7	13'.5	35'.1	6'.1	
123° 26'.1	17'.4	242° 53'.2	13'.5	29'.0	6'.2	
138° 25'.9	17'.9	257° 25'.7	13'.6	22'.8	6'.2	
153° 25'.8	18'.5	271° 58'.3	13'.6	16'.6	6'.4	
168° 25'.6	19'.0	286° 30'.9	13'.6	10'.2	6'.4	
183° 25'.4	20° 19'.5 S	301° 03'.5	13'.6	15° 03'.8 N	6'.4	54'.1
198° 25'.2	20'.0	315° 36'.1	13'.7	14° 57'.4 N	6'.5	
213° 25'.1	20'.5	330° 08'.8	13'.7	50'.9	6'.6	
228° 24'.9	21'.1	344° 41'.5	13'.7	44'.3	6'.7	
243° 24'.7	21'.6	359° 14'.2	13'.8	37'.6	6'.7	
258° 24'.6	22'.1	13° 47'.0	13'.8	30'.9	6'.8	
273° 24'.4	22'.6	28° 19'.8	13'.8	24'.1	6'.8	
288° 24'.2	23'.1	42° 52'.6	13'.8	17'.3	6'.9	
303° 24'.0	23'.7	57° 25'.4	13'.9	10'.4	7'.0	
318° 23'.9	24'.2	71° 58'.3	13'.9	03'.4	7'.0	54'.2
333° 23'.7	24'.7	86° 31'.2	13'.9	13° 56'.4 N	7'.1	
348° 23'.5	25'.2	101° 04'.1	13'.9	49'.3	7'.1	
3° 23'.3	20° 25'.7 S	115° 37'.0	14'.0	13° 42'.2 N	7'.2	54'.2
18° 23'.2	26'.2	130° 10'.0	14'.0	35'.0	7'.3	
33° 23'.0	26'.7	144° 43'.0	14'.0	27'.7	7'.3	
48° 22'.8	27'.3	159° 16'.0	14'.0	20'.4	7'.4	
63° 22'.6	27'.8	173° 49'.0	14'.1	13'.0	7'.4	
78° 22'.4	28'.3	188° 22'.1	14'.0	05'.6	7'.5	
93° 22'.3	28'.8	202° 55'.1	14'.1	12° 58'.1 N	7'.6	
108° 22'.1	29'.3	217° 28'.2	14'.2	50'.5	7'.6	
123° 21'.9	29'.8	232° 01'.4	14'.1	42'.9	7'.6	
138° 21'.7	30'.3	246° 34'.5	14'.2	35'.3	7'.8	
153° 21'.6	30'.8	261° 07'.7	14'.2	27'.5	7'.7	54'.3
168° 21'.4	31'.3	275° 40'.9	14'.2	19'.8	7'.9	
SD 16'.2	d 0'.5	SD	14'.8	14'.7	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23
N 72°	07:24	09:08	-	15:27	17:47	19:36
N 70°	07:11	08:39	10:46	16:52	18:26	20:00
68°	07:00	08:17	09:48	17:31	18:53	20:18
66°	06:51	08:00	09:14	17:57	19:13	20:33
64°	06:44	07:46	08:50	18:18	19:30	20:45
62°	06:37	07:34	08:31	18:35	19:43	20:55
60°	06:31	07:24	08:15	18:48	19:54	21:04
N 58°	06:25	07:15	08:02	19:00	20:04	21:11
56°	06:20	07:07	07:51	19:10	20:13	21:18
54°	06:16	07:00	07:41	19:19	20:20	21:24
52°	06:11	06:53	07:32	19:27	20:27	21:29
50°	06:07	06:47	07:24	19:35	20:33	21:34
45°	05:58	06:35	07:07	19:50	20:46	21:44
N 40°	05:50	06:24	06:53	20:03	20:57	21:53
35°	05:43	06:14	06:41	20:13	21:07	22:00
30°	05:36	06:05	06:31	20:23	21:15	22:07
20°	05:23	05:50	06:13	20:39	21:29	22:18
N 10°	05:09	05:35	05:57	20:53	21:41	22:28
0°	04:55	05:21	05:43	21:06	21:52	22:37
S 10°	04:39	05:05	05:28	21:20	22:04	22:46
20°	04:19	04:48	05:12	21:34	22:16	22:56
30°	03:55	04:26	04:53	21:50	22:30	23:07
35°	03:39	04:14	04:42	21:59	22:38	23:13
40°	03:19	03:58	04:29	22:10	22:47	23:20
45°	02:55	03:40	04:15	22:22	22:57	23:29
S 50°	02:20	03:16	03:56	22:37	23:10	23:39
52°	02:02	03:04	03:47	22:44	23:16	23:44
54°	01:39	02:50	03:38	22:52	23:23	23:49
56°	01:06	02:34	03:27	23:01	23:30	23:54
58°	-	02:15	03:14	23:11	23:38	24:01
S 60°	-	01:50	02:59	23:22	23:48	24:08
S 62°	-	01:15	02:41	23:35	23:58	24:16

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 21	Moonset 22	Moonset 23
N 72°	-	14:23	16:07	14:29	13:45	13:29
N 70°	12:45	14:52	16:20	13:04	13:05	13:04
68°	13:44	15:14	16:31	12:24	12:38	12:45
66°	14:17	15:31	16:40	11:57	12:17	12:29
64°	14:42	15:46	16:48	11:36	12:00	12:17
62°	15:01	15:58	16:55	11:19	11:46	12:06
60°	15:16	16:08	17:01	11:05	11:34	11:57
N 58°	15:30	16:17	17:06	10:53	11:24	11:48
56°	15:41	16:25	17:11	10:43	11:15	11:41
54°	15:51	16:32	17:16	10:33	11:07	11:35
52°	16:00	16:38	17:20	10:25	11:00	11:29
50°	16:08	16:44	17:24	10:18	10:53	11:24
45°	16:25	16:57	17:33	10:02	10:39	11:12
N 40°	16:39	17:08	17:42	09:48	10:28	11:03
35°	16:51	17:18	17:49	09:37	10:18	10:55
30°	17:01	17:27	17:56	09:28	10:09	10:48
20°	17:19	17:43	18:10	09:11	09:54	10:35
N 10°	17:35	17:57	18:23	08:56	09:41	10:24
0°	17:50	18:12	18:37	08:42	09:29	10:14
S 10°	18:05	18:27	18:54	08:28	09:16	10:04
20°	18:21	18:45	19:13	08:13	09:03	09:53
30°	18:40	19:06	19:38	07:56	08:48	09:40
35°	18:51	19:19	19:54	07:46	08:39	09:32
40°	19:03	19:35	20:14	07:35	08:29	09:24
45°	19:18	19:54	20:39	07:21	08:17	09:14
S 50°	19:37	20:18	21:13	07:05	08:02	09:02
52°	19:46	20:30	21:32	06:57	07:56	08:57
54°	19:56	20:44	21:56	06:49	07:48	08:50
56°	20:07	21:00	22:30	06:39	07:40	08:44
58°	20:20	21:20	-	06:28	07:30	08:36
S 60°	20:35	21:45	-	06:15	07:19	08:27
S 62°	20:53	22:22	-	06:00	07:06	08:17

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
21	14 13	14 06	11:46	02:31	14:54	18d 87%
22	13 58	13 50	11:46	03:18	15:41	19d 80%
23	13 42	13 34	11:46	04:03	16:25	20d 71%

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2013 November 24, 25, 26 (Sun, Mon, Tue)

GMT	ARIES	VENUS -4.6		MARS +1.3		JUPITER -2.5		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
24 Sunday									
00	63° 07'.0	134° 47'.9	25° 49'.0 S	249° 09'.5	4° 32'.7 N	311° 25'.6	21° 58'.3 N	198° 37'.9	14° 41'.2 S
01	78° 09'.4	149° 48'.3	48'.6	264° 10'.7	32'.2	326° 28'.2	58'.3	213° 40'.1	41'.3
02	93° 11'.9	164° 48'.6	48'.3	279° 11'.9	31'.7	341° 30'.8	58'.3	228° 42'.3	41'.4
03	108° 14'.4	179° 49'.0	47'.9	294° 13'.2	31'.1	356° 33'.4	58'.4	243° 44'.4	41'.5
04	123° 16'.8	194° 49'.4	47'.5	309° 14'.4	30'.6	11° 36'.0	58'.4	258° 46'.6	41'.5
05	138° 19'.3	209° 49'.7	47'.2	324° 15'.6	30'.1	26° 38'.6	58'.4	273° 48'.8	41'.6
06	153° 21'.8	224° 50'.1	46'.8	339° 16'.8	29'.6	41° 41'.3	58'.4	288° 51'.0	41'.7
07	168° 24'.2	239° 50'.5	46'.4	354° 18'.0	29'.1	56° 43'.9	58'.5	303° 53'.1	41'.8
08	183° 26'.7	254° 50'.9	46'.1	9° 19'.2	28'.6	71° 46'.5	58'.5	318° 55'.3	41'.9
09	198° 29'.1	269° 51'.3	45'.7	24° 20'.4	28'.1	86° 49'.1	58'.5	333° 57'.5	42'.0
10	213° 31'.6	284° 51'.6	45'.3	39° 21'.6	27'.5	101° 51'.7	58'.6	348° 59'.7	42'.0
11	228° 34'.1	299° 52'.0	45'.0	54° 22'.8	27'.0	116° 54'.3	58'.6	4° 01'.8	42'.1
12	243° 36'.5	314° 52'.4	25° 44'.6 S	69° 24'.0	4° 26'.5 N	131° 56'.9	21° 58'.6 N	19° 04'.0	14° 42'.2 S
13	258° 39'.0	329° 52'.8	44'.2	84° 25'.2	26'.0	146° 59'.6	58'.6	34° 06'.2	42'.3
14	273° 41'.5	344° 53'.2	43'.8	99° 26'.4	25'.5	162° 02'.2	58'.7	49° 08'.4	42'.4
15	288° 43'.9	359° 53'.6	43'.5	114° 27'.6	25'.0	177° 04'.8	58'.7	64° 10'.5	42'.4
16	303° 46'.4	14° 54'.0	43'.1	129° 28'.8	24'.5	192° 07'.4	58'.7	79° 12'.7	42'.5
17	318° 48'.9	29° 54'.4	42'.7	144° 30'.0	23'.9	207° 10'.0	58'.7	94° 14'.9	42'.6
18	333° 51'.3	44° 54'.8	42'.3	159° 31'.2	23'.4	222° 12'.6	58'.8	109° 17'.1	42'.7
19	348° 53'.8	59° 55'.2	41'.9	174° 32'.4	22'.9	237° 15'.3	58'.8	124° 19'.2	42'.8
20	3° 56'.3	74° 55'.6	41'.6	189° 33'.6	22'.4	252° 17'.9	58'.8	139° 21'.4	42'.9
21	18° 58'.7	89° 56'.0	41'.2	204° 34'.8	21'.9	267° 20'.5	58'.8	154° 23'.6	42'.9
22	34° 01'.2	104° 56'.4	40'.8	219° 36'.1	21'.4	282° 23'.1	58'.9	169° 25'.8	43'.0
23	49° 03'.6	119° 56'.8	40'.4	234° 37'.3	20'.9	297° 25'.7	58'.9	184° 27'.9	43'.1
25 Monday									
00	64° 06'.1	134° 57'.2	25° 40'.0 S	249° 38'.5	4° 20'.3 N	312° 28'.3	21° 58'.9 N	199° 30'.1	14° 43'.2 S
01	79° 08'.6	149° 57'.7	39'.7	264° 39'.7	19'.8	327° 31'.0	59'.0	214° 32'.3	43'.3
02	94° 11'.0	164° 58'.1	39'.3	279° 40'.9	19'.3	342° 33'.6	59'.0	229° 34'.5	43'.3
03	109° 13'.5	179° 58'.5	38'.9	294° 42'.1	18'.8	357° 36'.2	59'.0	244° 36'.6	43'.4
04	124° 16'.0	194° 58'.9	38'.5	309° 43'.3	18'.3	12° 38'.8	59'.0	259° 38'.8	43'.5
05	139° 18'.4	209° 59'.3	38'.1	324° 44'.5	17'.8	27° 41'.4	59'.1	274° 41'.0	43'.6
06	154° 20'.9	224° 59'.8	37'.7	339° 45'.7	17'.3	42° 44'.1	59'.1	289° 43'.2	43'.7
07	169° 23'.4	240° 00'.2	37'.4	354° 46'.9	16'.7	57° 46'.7	59'.1	304° 45'.3	43'.7
08	184° 25'.8	255° 00'.6	37'.0	9° 48'.1	16'.2	72° 49'.3	59'.1	319° 47'.5	43'.8
09	199° 28'.3	270° 01'.1	36'.6	24° 49'.3	15'.7	87° 51'.9	59'.2	334° 49'.7	43'.9
10	214° 30'.8	285° 01'.5	36'.2	39° 50'.6	15'.2	102° 54'.5	59'.2	349° 51'.8	44'.0
11	229° 33'.2	300° 01'.9	35'.8	54° 51'.8	14'.7	117° 57'.2	59'.2	4° 54'.0	44'.1
12	244° 35'.7	315° 02'.4	25° 35'.4 S	69° 53'.0	4° 14'.2 N	132° 59'.8	21° 59'.3 N	19° 56'.2	14° 44'.2 S
13	259° 38'.1	330° 02'.8	35'.0	84° 54'.2	13'.7	148° 02'.4	59'.3	34° 58'.4	44'.2
14	274° 40'.6	345° 03'.2	34'.6	99° 55'.4	13'.2	163° 05'.0	59'.3	50° 00'.5	44'.3
15	289° 43'.1	0° 03'.7	34'.2	114° 56'.6	12'.6	178° 07'.7	59'.3	65° 02'.7	44'.4
16	304° 45'.5	15° 04'.1	33'.9	129° 57'.8	12'.1	193° 10'.3	59'.4	80° 04'.9	44'.5
17	319° 48'.0	30° 04'.6	33'.5	144° 59'.0	11'.6	208° 12'.9	59'.4	95° 07'.1	44'.6
18	334° 50'.5	45° 05'.0	33'.1	160° 00'.2	11'.1	223° 15'.5	59'.4	110° 09'.2	44'.6
19	349° 52'.9	60° 05'.5	32'.7	175° 01'.5	10'.6	238° 18'.2	59'.5	125° 11'.4	44'.7
20	4° 55'.4	75° 05'.9	32'.3	190° 02'.7	10'.1	253° 20'.8	59'.5	140° 13'.6	44'.8
21	19° 57'.9	90° 06'.4	31'.9	205° 03'.9	09'.6	268° 23'.4	59'.5	155° 15'.8	44'.9
22	35° 00'.3	105° 06'.9	31'.5	220° 05'.1	09'.1	283° 26'.0	59'.5	170° 17'.9	45'.0
23	50° 02'.8	120° 07'.3	31'.1	235° 06'.3	08'.5	298° 28'.7	59'.6	185° 20'.1	45'.0
26 Tuesday									
00	65° 05'.2	135° 07'.8	25° 30'.7 S	250° 07'.5	4° 08'.0 N	313° 31'.3	21° 59'.6 N	200° 22'.3	14° 45'.1 S
01	80° 07'.7	150° 08'.3	30'.3	265° 08'.7	07'.5	328° 33'.9	59'.6	215° 24'.5	45'.2
02	95° 10'.2	165° 08'.7	29'.9	280° 09'.9	07'.0	343° 36'.5	59'.6	230° 26'.6	45'.3
03	110° 12'.6	180° 09'.2	29'.5	295° 11'.1	06'.5	358° 39'.2	59'.7	245° 28'.8	45'.4
04	125° 15'.1	195° 09'.7	29'.1	310° 12'.4	06'.0	13° 41'.8	59'.7	260° 31'.0	45'.4
05	140° 17'.6	210° 10'.1	28'.7	325° 13'.6	05'.5	28° 44'.4	59'.7	275° 33'.2	45'.5
06	155° 20'.0	225° 10'.6	28'.3	340° 14'.8	05'.0	43° 47'.1	59'.8	290° 35'.3	45'.6
07	170° 22'.5	240° 11'.1	27'.9	355° 16'.0	04'.5	58° 49'.7	59'.8	305° 37'.5	45'.7
08	185° 25'.0	255° 11'.6	27'.5	10° 17'.2	03'.9	73° 52'.3	59'.8	320° 39'.7	45'.8
09	200° 27'.4	270° 12'.1	27'.1	25° 18'.4	03'.4	88° 55'.0	59'.8	335° 41'.9	45'.9
10	215° 29'.9	285° 12'.5	26'.7	40° 19'.6	02'.9	103° 57'.6	59'.9	350° 44'.0	45'.9
11	230° 32'.4	300° 13'.0	26'.3	55° 20'.9	02'.4	119° 00'.2	59'.9	5° 46'.2	46'.0
12	245° 34'.8	315° 13'.5	25° 25'.9 S	70° 22'.1	4° 01'.9 N	134° 02'.8	21° 59'.9 N	20° 48'.4	14° 46'.1 S
13	260° 37'.3	330° 14'.0	25'.5	85° 23'.3	01'.4	149° 05'.5	22° 00'.0 N	35° 50'.6	46'.2
14	275° 39'.7	345° 14'.5	25'.1	100° 24'.5	00'.9	164° 08'.1	00'.0	50° 52'.7	46'.3
15	290° 42'.2	0° 15'.0	24'.7	115° 25'.7	00'.4	179° 10'.7	00'.0	65° 54'.9	46'.3
16	305° 44'.7	15° 15'.5	24'.3	130° 26'.9	3° 59'.8 N	194° 13'.4	00'.1	80° 57'.1	46'.4
17	320° 47'.1	30° 16'.0	23'.8	145° 28'.1	59'.3	209° 16'.0	00'.1	95° 59'.3	46'.5
18	335° 49'.6	45° 16'.5	23'.4	160° 29'.4	58'.8	224° 18'.6	00'.1	111° 01'.5	46'.6
19	350° 52'.1	60° 17'.0	23'.0	175° 30'.6	58'.3	239° 21'.3	00'.1	126° 03'.6	46'.7
20	5° 54'.5	75° 17'.5	22'.6	190° 31'.8	57'.8	254° 23'.9	00'.2	141° 05'.8	46'.7
21	20° 57'.0	90° 18'.0	22'.2	205° 33'.0	57'.3	269° 26'.5	00'.2	156° 08'.0	46'.8
22	35° 59'.5	105° 18'.6	21'.8	220° 34'.2	56'.8	284° 29'.2	00'.2	171° 10'.2	46'.9
23	51° 01'.9	120° 19'.1	21'.4	235° 35'.4	56'.3	299° 31'.8	00'.3	186° 12'.3	47'.0
	M.P. 19:40	v 0'.4	d 0'.4	v 1'.2	d 0'.5	v 2'.6	d 0'.0	v 2'.2	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 17'.7	40° 15'.1 S
Achernar	335° 26'.2	57° 10'.1 S
Acrux	173° 09'.3	63° 10'.3 S
Adhara	255° 12'.0	28° 59'.5 S
Aldebaran	290° 48'.7	16° 32'.1 N
Alioth	166° 20'.9	55° 52'.9 N
Alkaid	152° 59'.1	49° 14'.5 N
Alnair	27° 43'.4	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.7 S
Alphard	217° 55'.7	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.2 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.1	8° 54'.6 N
Ankaa	353° 15'.2	42° 14'.0 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.7 N
Atria	107° 28'.3	69° 03'.0 S
Avior	234° 17'.5	59° 33'.1 S
Bellatrix	278° 31'.4	6° 21'.6 N
Betelgeuse	271° 00'.7	7° 24'.4 N
Canopus	263° 55'.5	52° 42'.2 S
Capella	280° 33'.5	46° 00'.5 N
Deneb	49° 31'.4	45° 20'.2 N
Denebola	182° 33'.5	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.6	61° 40'.2 N
Elnath	278° 11'.9	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.5 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.6	29° 32'.9 S
Gacrux	172° 00'.8	57° 11'.2 S
Gienah	175° 52'.1	17° 37'.0 S
Hadar	148° 47'.9	60° 26'.2 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.3	74° 05'.8 N
Markab	13° 38'.0	15° 17'.1 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.1 S
Miaplacidus	221° 39'.2	69° 46'.3 S
Mirfak	308° 39'.4	49° 54'.6 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.1	56° 41'.4 S
Polaris	317° 10'.5	89° 19'.5 N
Pollux	243° 27'.1	27° 59'.3 N
Procyon	244° 59'.2	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.3 N
Regulus	207° 43'.2	11° 53'.8 N
Rigel	281° 11'.4	8° 11'.2 S
Rigil Kent	139° 51'.8	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.7	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.7 S
Sirius	258° 33'.2	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.0	43° 29'.2 S
Vega	80° 39'.1	38° 48'.1 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	70° 51'.1	15:00
Mars	185° 32'.4	07:21
Jupiter	248° 22'.2	03:10
Saturn	135° 24'.0	10:40

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 21'.2	20° 31'.8 S	290° 14'.1	14'.2	12° 11'.9 N	7'.9	54'.3
198° 21'.0	32'.3	304° 47'.3	14'.2	04'.0	7'.9	
213° 20'.8	32'.9	319° 20'.5	14'.3	11° 56'.1 N	8'.0	
228° 20'.7	33'.4	333° 53'.8	14'.3	48'.1	8'.0	
243° 20'.5	33'.9	348° 27'.1	14'.3	40'.1	8'.1	
258° 20'.3	34'.4	3° 00'.4	14'.3	32'.0	8'.2	
273° 20'.1	34'.9	17° 33'.7	14'.3	23'.8	8'.1	
288° 19'.9	35'.4	32° 07'.0	14'.4	15'.7	8'.3	54'.4
303° 19'.7	35'.9	46° 40'.4	14'.3	07'.4	8'.3	
318° 19'.6	36'.4	61° 13'.7	14'.4	10° 59'.1 N	8'.3	
333° 19'.4	36'.9	75° 47'.1	14'.4	50'.8	8'.4	
348° 19'.2	37'.4	90° 20'.5	14'.4	42'.4	8'.5	
3° 19'.0	20° 37'.9 S	104° 53'.9	14'.4	10° 33'.9 N	8'.5	54'.4
18° 18'.8	38'.4	119° 27'.3	14'.4	25'.4	8'.5	
33° 18'.6	38'.9	134° 00'.7	14'.5	16'.9	8'.6	54'.5
48° 18'.5	39'.4	148° 34'.2	14'.4	08'.3	8'.6	
63° 18'.3	39'.9	163° 07'.6	14'.5	9° 59'.7 N	8'.7	
78° 18'.1	40'.4	177° 41'.1	14'.5	51'.0	8'.7	
93° 17'.9	40'.8	192° 14'.6	14'.4	42'.3	8'.8	
108° 17'.7	41'.3	206° 48'.0	14'.5	33'.5	8'.8	
123° 17'.5	41'.8	221° 21'.5	14'.5	24'.7	8'.9	
138° 17'.3	42'.3	235° 55'.0	14'.5	15'.8	8'.9	54'.6
153° 17'.2	42'.8	250° 28'.5	14'.6	06'.9	8'.9	
168° 17'.0	43'.3	265° 02'.1	14'.5	8° 58'.0 N	9'.0	
183° 16'.8	20° 43'.8 S	279° 35'.6	14'.5	8° 49'.0 N	9'.0	54'.6
198° 16'.6	44'.3	294° 09'.1	14'.5	40'.0	9'.1	
213° 16'.4	44'.8	308° 42'.6	14'.6	30'.9	9'.1	
228° 16'.2	45'.3	323° 16'.2	14'.5	21'.8	9'.2	54'.7
243° 16'.0	45'.8	337° 49'.7	14'.6	12'.6	9'.2	
258° 15'.8	46'.2	352° 23'.3	14'.5	03'.4	9'.2	
273° 15'.7	46'.7	6° 56'.8	14'.6	7° 54'.2 N	9'.3	
288° 15'.5	47'.2	21° 30'.4	14'.5	44'.9	9'.3	
303° 15'.3	47'.7	36° 03'.9	14'.5	35'.6	9'.4	54'.8
318° 15'.1	48'.2	50° 37'.4	14'.6	26'.2	9'.4	
333° 14'.9	48'.7	65° 11'.0	14'.5	16'.8	9'.4	
348° 14'.7	49'.2	79° 44'.5	14'.6	07'.4	9'.5	
3° 14'.5	20° 49'.6 S	94° 18'.1	14'.5	6° 57'.9 N	9'.5	54'.8
18° 14'.3	50'.1	108° 51'.6	14'.6	48'.4	9'.5	54'.9
33° 14'.1	50'.6	123° 25'.2	14'.5	38'.9	9'.6	
48° 13'.9	51'.1	137° 58'.7	14'.5	29'.3	9'.6	
63° 13'.7	51'.6	152° 32'.2	14'.6	19'.7	9'.6	
78° 13'.5	52'.0	167° 05'.8	14'.5	10'.1	9'.7	55'.0
93° 13'.3	52'.5	181° 39'.3	14'.5	00'.4	9'.7	
108° 13'.2	53'.0	196° 12'.8	14'.5	5° 50'.7 N	9'.8	
123° 13'.0	53'.5	210° 46'.3	14'.5	40'.9	9'.7	
138° 12'.8	53'.9	225° 19'.8	14'.5	31'.2	9'.8	
153° 12'.6	54'.4	239° 53'.3	14'.5	21'.4	9'.9	55'.1
168° 12'.4	54'.9	254° 26'.8	14'.4	11'.5	9'.9	
183° 12'.2	20° 55'.4 S	269° 00'.2	14'.5	5° 01'.6 N	9'.9	55'.1
198° 12'.0	55'.8	283° 33'.7	14'.4	4° 51'.7 N	9'.9	
213° 11'.8	56'.3	298° 07'.1	14'.5	41'.8	9'.9	55'.2
228° 11'.6	56'.8	312° 40'.6	14'.4	31'.9	10'.0	
243° 11'.4	57'.3	327° 14'.0	14'.4	21'.9	10'.0	
258° 11'.2	57'.7	341° 47'.4	14'.4	11'.9	10'.1	
273° 11'.0	58'.2	356° 20'.8	14'.4	01'.8	10'.1	55'.3
288° 10'.8	58'.7	10° 54'.2	14'.3	3° 51'.7 N	10'.1	
303° 10'.6	59'.1	25° 27'.5	14'.4	41'.6	10'.1	
318° 10'.4	59'.6	40° 00'.9	14'.3	31'.5	10'.1	55'.4
333° 10'.2	21° 00'.1 S	54° 34'.2	14'.3	21'.4	10'.2	
348° 10'.0	00'.5	69° 07'.5	14'.3	11'.2	10'.2	
3° 09'.8	21° 01'.0 S	83° 40'.8	14'.2	3° 01'.0 N	10'.2	55'.4
18° 09'.6	01'.5	98° 14'.0	14'.3	2° 50'.8 N	10'.3	55'.5
33° 09'.4	01'.9	112° 47'.3	14'.2	40'.5	10'.2	
48° 09'.2	02'.4	127° 20'.5	14'.2	30'.3	10'.3	
63° 09'.0	02'.9	141° 53'.7	14'.1	20'.0	10'.3	
78° 08'.8	03'.3	156° 26'.8	14'.2	09'.7	10'.3	55'.6
93° 08'.6	03'.8	171° 00'.0	14'.1	1° 59'.4 N	10'.4	
108° 08'.4	04'.3	185° 33'.1	14'.1	49'.0	10'.4	
123° 08'.2	04'.7	200° 06'.2	14'.1	38'.6	10'.3	55'.7
138° 08'.0	05'.2	214° 39'.3	14'.0	28'.3	10'.5	
153° 07'.8	05'.6	229° 12'.3	14'.0	17'.8	10'.4	
168° 07'.6	06'.1	243° 45'.3	14'.0	07'.4	10'.4	55'.8
SD 16'.2	d 0'.5	SD	14'.8	14'.9	15'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 24	Moonrise 25	Moonrise 26
N 72°	07:34	09:22	-	21:18	22:59	24:39
N 70°	07:19	08:50	11:40	21:33	23:06	24:40
68°	07:08	08:27	10:03	21:45	23:12	24:41
66°	06:58	08:08	09:25	21:54	23:17	24:42
64°	06:50	07:53	08:59	22:02	23:21	24:42
62°	06:43	07:41	08:39	22:09	23:25	24:43
60°	06:36	07:30	08:22	22:15	23:28	24:43
N 58°	06:30	07:20	08:08	22:20	23:31	24:44
56°	06:25	07:12	07:56	22:25	23:34	24:44
54°	06:20	07:05	07:46	22:29	23:36	24:44
52°	06:16	06:58	07:37	22:33	23:38	24:45
50°	06:11	06:52	07:28	22:36	23:40	24:45
45°	06:02	06:38	07:11	22:43	23:44	24:46
N 40°	05:53	06:27	06:56	22:50	23:47	24:46
35°	05:46	06:17	06:44	22:55	23:50	24:46
30°	05:38	06:08	06:33	22:59	23:53	24:47
20°	05:24	05:51	06:15	23:07	23:57	24:47
N 10°	05:10	05:36	05:59	23:14	-	00:01
0°	04:56	05:21	05:43	23:21	-	00:05
S 10°	04:39	05:05	05:28	23:27	-	00:08
20°	04:19	04:47	05:11	23:34	-	00:12
30°	03:53	04:25	04:52	23:42	-	00:16
35°	03:37	04:12	04:41	23:47	-	00:19
40°	03:17	03:56	04:28	23:52	-	00:22
45°	02:51	03:37	04:12	23:58	-	00:25
S 50°	02:15	03:12	03:53	-	00:05	00:29
52°	01:56	03:00	03:44	-	00:08	00:31
54°	01:31	02:45	03:34	-	00:12	00:33
56°	00:53	02:28	03:22	-	00:16	00:35
58°	-	02:08	03:09	00:01	00:20	00:38
S 60°	-	01:41	02:53	00:08	00:25	00:40
S 62°	-	01:00	02:34	00:16	00:31	00:43

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 24	Moonset 25	Moonset 26
N 72°	-	14:11	15:59	13:19	13:09	13:01
N 70°	11:53	14:43	16:14	13:02	13:00	12:57
68°	13:30	15:07	16:25	12:49	12:52	12:54
66°	14:08	15:25	16:35	12:39	12:46	12:52
64°	14:34	15:40	16:43	12:30	12:40	12:49
62°	14:55	15:53	16:51	12:22	12:35	12:48
60°	15:11	16:04	16:57	12:15	12:31	12:46
N 58°	15:25	16:13	17:03	12:09	12:27	12:44
56°	15:37	16:21	17:09	12:04	12:24	12:43
54°	15:48	16:29	17:13	11:59	12:21	12:42
52°	15:57	16:36	17:18	11:55	12:18	12:41
50°	16:05	16:42	17:22	11:51	12:16	12:40
45°	16:23	16:56	17:32	11:43	12:10	12:37
N 40°	16:37	17:07	17:40	11:35	12:06	12:36
35°	16:50	17:17	17:48	11:29	12:02	12:34
30°	17:00	17:26	17:56	11:24	11:58	12:33
20°	17:19	17:43	18:10	11:14	11:52	12:30
N 10°	17:35	17:58	18:24	11:06	11:47	12:28
0°	17:51	18:13	18:39	10:58	11:42	12:26
S 10°	18:06	18:29	18:55	10:50	11:37	12:23
20°	18:23	18:47	19:15	10:42	11:31	12:21
30°	18:42	19:09	19:41	10:32	11:25	12:18
35°	18:54	19:22	19:58	10:27	11:21	12:17
40°	19:07	19:38	20:18	10:20	11:17	12:15
45°	19:22	19:58	20:44	10:13	11:12	12:13
S 50°	19:42	20:23	21:20	10:04	11:06	12:11
52°	19:51	20:36	21:40	09:59	11:04	12:10
54°	20:01	20:50	22:06	09:55	11:01	12:08
56°	20:13	21:07	22:46	09:50	10:57	12:07
58°	20:26	21:28	-	09:44	10:54	12:05
S 60°	20:42	21:56	-	09:37	10:50	12:04
S 62°	21:02	22:40	-	09:30	10:45	12:02

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
24	13 25	13 16	11:47	04:48	17:10	21d 63%
25	13 08	12 58	11:47	05:31	17:53	22d 53%
26	12 49	12 40	11:47	06:15	18:37	23d 43%

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2013 November 27, 28, 29 (Wed, Thur, Fri)

GMT	ARIES	VENUS -4.6		MARS +1.3		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
27 Wednesday									
00	66° 04'.4	135° 19'.6	25° 21'.0 S	250° 36'.7	3° 55'.8 N	314° 34'.4	22° 00'.3 N	201° 14'.5	14° 47'.1 S
01	81° 06'.9	150° 20'.1	20'.6	265° 37'.9	55'.3	329° 37'.1	00'.3	216° 16'.7	47'.1
02	96° 09'.3	165° 20'.6	20'.1	280° 39'.1	54'.7	344° 39'.7	00'.3	231° 18'.9	47'.2
03	111° 11'.8	180° 21'.1	19'.7	295° 40'.3	54'.2	359° 42'.4	00'.4	246° 21'.0	47'.3
04	126° 14'.2	195° 21'.7	19'.3	310° 41'.5	53'.7	14° 45'.0	00'.4	261° 23'.2	47'.4
05	141° 16'.7	210° 22'.2	18'.9	325° 42'.8	53'.2	29° 47'.6	00'.4	276° 25'.4	47'.5
06	156° 19'.2	225° 22'.7	18'.5	340° 44'.0	52'.7	44° 50'.3	00'.5	291° 27'.6	47'.5
07	171° 21'.6	240° 23'.3	18'.1	355° 45'.2	52'.2	59° 52'.9	00'.5	306° 29'.7	47'.6
08	186° 24'.1	255° 23'.8	17'.7	10° 46'.4	51'.7	74° 55'.5	00'.5	321° 31'.9	47'.7
09	201° 26'.6	270° 24'.3	17'.2	25° 47'.6	51'.2	89° 58'.2	00'.5	336° 34'.1	47'.8
10	216° 29'.0	285° 24'.9	16'.8	40° 48'.8	50'.7	105° 00'.8	00'.6	351° 36'.3	47'.9
11	231° 31'.5	300° 25'.4	16'.4	55° 50'.1	50'.1	120° 03'.5	00'.6	6° 38'.4	47'.9
12	246° 34'.0	315° 26'.0	25° 16'.0 S	70° 51'.3	3° 49'.6 N	135° 06'.1	22° 00'.6 N	21° 40'.6	14° 48'.0 S
13	261° 36'.4	330° 26'.5	15'.6	85° 52'.5	49'.1	150° 08'.7	00'.7	36° 42'.8	48'.1
14	276° 38'.9	345° 27'.1	15'.1	100° 53'.7	48'.6	165° 11'.4	00'.7	51° 45'.0	48'.2
15	291° 41'.3	0° 27'.6	14'.7	115° 54'.9	48'.1	180° 14'.0	00'.7	66° 47'.1	48'.3
16	306° 43'.8	15° 28'.2	14'.3	130° 56'.2	47'.6	195° 16'.7	00'.8	81° 49'.3	48'.3
17	321° 46'.3	30° 28'.7	13'.9	145° 57'.4	47'.1	210° 19'.3	00'.8	96° 51'.5	48'.4
18	336° 48'.7	45° 29'.3	13'.4	160° 58'.6	46'.6	225° 21'.9	00'.8	111° 53'.7	48'.5
19	351° 51'.2	60° 29'.8	13'.0	175° 59'.8	46'.1	240° 24'.6	00'.8	126° 55'.9	48'.6
20	6° 53'.7	75° 30'.4	12'.6	191° 01'.0	45'.6	255° 27'.2	00'.9	141° 58'.0	48'.7
21	21° 56'.1	90° 31'.0	12'.2	206° 02'.3	45'.1	270° 29'.9	00'.9	157° 00'.2	48'.7
22	36° 58'.6	105° 31'.5	11'.7	221° 03'.5	44'.5	285° 32'.5	00'.9	172° 02'.4	48'.8
23	52° 01'.1	120° 32'.1	11'.3	236° 04'.7	44'.0	300° 35'.2	01'.0	187° 04'.6	48'.9
28 Thursday									
00	67° 03'.5	135° 32'.7	25° 10'.9 S	251° 05'.9	3° 43'.5 N	315° 37'.8	22° 01'.0 N	202° 06'.7	14° 49'.0 S
01	82° 06'.0	150° 33'.2	10'.5	266° 07'.2	43'.0	330° 40'.4	01'.0	217° 08'.9	49'.1
02	97° 08'.5	165° 33'.8	10'.0	281° 08'.4	42'.5	345° 43'.1	01'.1	232° 11'.1	49'.1
03	112° 10'.9	180° 34'.4	09'.6	296° 09'.6	42'.0	0° 45'.7	01'.1	247° 13'.3	49'.2
04	127° 13'.4	195° 35'.0	09'.2	311° 10'.8	41'.5	15° 48'.4	01'.1	262° 15'.4	49'.3
05	142° 15'.8	210° 35'.6	08'.8	326° 12'.0	41'.0	30° 51'.0	01'.2	277° 17'.6	49'.4
06	157° 18'.3	225° 36'.2	08'.3	341° 13'.3	40'.5	45° 53'.7	01'.2	292° 19'.8	49'.5
07	172° 20'.8	240° 36'.7	07'.9	356° 14'.5	40'.0	60° 56'.3	01'.2	307° 22'.0	49'.5
08	187° 23'.2	255° 37'.3	07'.5	11° 15'.7	39'.5	75° 59'.0	01'.2	322° 24'.2	49'.6
09	202° 25'.7	270° 37'.9	07'.0	26° 16'.9	38'.9	91° 01'.6	01'.3	337° 26'.3	49'.7
10	217° 28'.2	285° 38'.5	06'.6	41° 18'.2	38'.4	106° 04'.2	01'.3	352° 28'.5	49'.8
11	232° 30'.6	300° 39'.1	06'.2	56° 19'.4	37'.9	121° 06'.9	01'.3	7° 30'.7	49'.9
12	247° 33'.1	315° 39'.7	25° 05'.7 S	71° 20'.6	3° 37'.4 N	136° 09'.5	22° 01'.4 N	22° 32'.9	14° 49'.9 S
13	262° 35'.6	330° 40'.3	05'.3	86° 21'.8	36'.9	151° 12'.2	01'.4	37° 35'.0	50'.0
14	277° 38'.0	345° 40'.9	04'.9	101° 23'.1	36'.4	166° 14'.8	01'.4	52° 37'.2	50'.1
15	292° 40'.5	0° 41'.5	04'.4	116° 24'.3	35'.9	181° 17'.5	01'.5	67° 39'.4	50'.2
16	307° 42'.9	15° 42'.1	04'.0	131° 25'.5	35'.4	196° 20'.1	01'.5	82° 41'.6	50'.3
17	322° 45'.4	30° 42'.8	03'.6	146° 26'.7	34'.9	211° 22'.8	01'.5	97° 43'.7	50'.3
18	337° 47'.9	45° 43'.4	03'.1	161° 28'.0	34'.4	226° 25'.4	01'.6	112° 45'.9	50'.4
19	352° 50'.3	60° 44'.0	02'.7	176° 29'.2	33'.9	241° 28'.1	01'.6	127° 48'.1	50'.5
20	7° 52'.8	75° 44'.6	02'.2	191° 30'.4	33'.4	256° 30'.7	01'.6	142° 50'.3	50'.6
21	22° 55'.3	90° 45'.2	01'.8	206° 31'.6	32'.9	271° 33'.4	01'.6	157° 52'.5	50'.7
22	37° 57'.7	105° 45'.9	01'.4	221° 32'.9	32'.3	286° 36'.0	01'.7	172° 54'.6	50'.7
23	53° 00'.2	120° 46'.5	00'.9	236° 34'.1	31'.8	301° 38'.7	01'.7	187° 56'.8	50'.8
29 Friday									
00	68° 02'.7	135° 47'.1	25° 00'.5 S	251° 35'.3	3° 31'.3 N	316° 41'.3	22° 01'.7 N	202° 59'.0	14° 50'.9 S
01	83° 05'.1	150° 47'.7	00'.0	266° 36'.5	30'.8	331° 44'.0	01'.8	218° 01'.2	51'.0
02	98° 07'.6	165° 48'.4	24° 59'.6 S	281° 37'.8	30'.3	346° 46'.6	01'.8	233° 03'.3	51'.0
03	113° 10'.1	180° 49'.0	59'.2	296° 39'.0	29'.8	1° 49'.3	01'.8	248° 05'.5	51'.1
04	128° 12'.5	195° 49'.6	58'.7	311° 40'.2	29'.3	16° 52'.0	01'.9	263° 07'.7	51'.2
05	143° 15'.0	210° 50'.3	58'.3	326° 41'.5	28'.8	31° 54'.6	01'.9	278° 09'.9	51'.3
06	158° 17'.4	225° 50'.9	57'.8	341° 42'.7	28'.3	46° 57'.3	01'.9	293° 12'.1	51'.4
07	173° 19'.9	240° 51'.6	57'.4	356° 43'.9	27'.8	61° 59'.9	02'.0	308° 14'.2	51'.4
08	188° 22'.4	255° 52'.2	56'.9	11° 45'.1	27'.3	77° 02'.6	02'.0	323° 16'.4	51'.5
09	203° 24'.8	270° 52'.9	56'.5	26° 46'.4	26'.8	92° 05'.2	02'.0	338° 18'.6	51'.6
10	218° 27'.3	285° 53'.5	56'.1	41° 47'.6	26'.3	107° 07'.9	02'.1	353° 20'.8	51'.7
11	233° 29'.8	300° 54'.2	55'.6	56° 48'.8	25'.8	122° 10'.5	02'.1	8° 22'.9	51'.8
12	248° 32'.2	315° 54'.8	24° 55'.2 S	71° 50'.1	3° 25'.2 N	137° 13'.2	22° 02'.1 N	23° 25'.1	14° 51'.8 S
13	263° 34'.7	330° 55'.5	54'.7	86° 51'.3	24'.7	152° 15'.8	02'.2	38° 27'.3	51'.9
14	278° 37'.2	345° 56'.2	54'.3	101° 52'.5	24'.2	167° 18'.5	02'.2	53° 29'.5	52'.0
15	293° 39'.6	0° 56'.8	53'.8	116° 53'.7	23'.7	182° 21'.2	02'.2	68° 31'.7	52'.1
16	308° 42'.1	15° 57'.5	53'.4	131° 55'.0	23'.2	197° 23'.8	02'.2	83° 33'.8	52'.2
17	323° 44'.6	30° 58'.2	52'.9	146° 56'.2	22'.7	212° 26'.5	02'.3	98° 36'.0	52'.2
18	338° 47'.0	45° 58'.8	52'.5	161° 57'.4	22'.2	227° 29'.1	02'.3	113° 38'.2	52'.3
19	353° 49'.5	60° 59'.5	52'.0	176° 58'.7	21'.7	242° 31'.8	02'.3	128° 40'.4	52'.4
20	8° 51'.9	76° 00'.2	51'.6	191° 59'.9	21'.2	257° 34'.4	02'.4	143° 42'.5	52'.5
21	23° 54'.4	91° 00'.9	51'.1	207° 01'.1	20'.7	272° 37'.1	02'.4	158° 44'.7	52'.5
22	38° 56'.9	106° 01'.6	50'.7	222° 02'.4	20'.2	287° 39'.8	02'.4	173° 46'.9	52'.6
23	53° 59'.3	121° 02'.2	50'.2	237° 03'.6	19'.7	302° 42'.4	02'.5	188° 49'.1	52'.7
	M.P. 19:29	v 0'.6	d 0'.4	v 1'.2	d 0'.5	v 2'.6	d 0'.0	v 2'.2	d 0'.1

STARS		
Name	SHA	Dec
Acamar	315° 17'.7	40° 15'.1 S
Achernar	335° 26'.2	57° 10'.2 S
Acrux	173° 09'.2	63° 10'.3 S
Adhara	255° 12'.0	28° 59'.5 S
Aldebaran	290° 48'.7	16° 32'.1 N
Alioth	166° 20'.9	55° 52'.8 N
Alkaid	152° 59'.1	49° 14'.5 N
Alnair	27° 43'.5	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.7 S
Alphard	217° 55'.7	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.2 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.2	8° 54'.6 N
Ankaa	353° 15'.2	42° 14'.0 S
Antares	112° 26'.3	26° 27'.6 S
Arcturus	145° 55'.8	19° 06'.6 N
Atria	107° 28'.3	69° 03'.0 S
Avior	234° 17'.5	59° 33'.1 S
Bellatrix	278° 31'.3	6° 21'.6 N
Betelgeuse	271° 00'.7	7° 24'.4 N
Canopus	263° 55'.5	52° 42'.2 S
Capella	280° 33'.5	46° 00'.5 N
Deneb	49° 31'.5	45° 20'.2 N
Denebola	182° 33'.5	14° 29'.6 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.5	61° 40'.2 N
Elnath	278° 11'.9	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.5 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.6	29° 32'.9 S
Gacrux	172° 00'.8	57° 11'.2 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.9	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.3	74° 05'.8 N
Markab	13° 38'.0	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.1 S
Miaplacidus	221° 39'.2	69° 46'.3 S
Mirfak	308° 39'.4	49° 54'.6 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.1	56° 41'.4 S
Polaris	317° 10'.8	89° 19'.5 N
Pollux	243° 27'.1	27° 59'.3 N
Procyon	244° 59'.2	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.2 N
Regulus	207° 43'.2	11° 53'.8 N
Rigel	281° 11'.4	8° 11'.2 S
Rigil Kent	139° 51'.8	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.8	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.2	16° 44'.2 S
Spica	158° 31'.2	11° 13'.9 S
Suhail	222° 52'.0	43° 29'.2 S
Vega	80° 39'.1	38° 48'.1 N
Zuben'ubi	137° 05'.4	16° 05'.8 S
	SHA	Mer.Pass.
Venus	68° 29'.1	14:57
Mars	184° 02'.4	07:15
Jupiter	248° 34'.3	02:57
Saturn	135° 03'.2	10:30

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
183° 07'.4	21° 06'.6 S	258° 18'.3	13'.9	0° 57'.0 N	10'.5	55'.8
198° 07'.2	07'.0	272° 51'.2	13'.9	46'.5	10'.4	
213° 07'.0	07'.5	287° 24'.1	13'.9	36'.1	10'.5	
228° 06'.8	07'.9	301° 57'.0	13'.9	25'.6	10'.5	55'.9
243° 06'.6	08'.4	316° 29'.9	13'.8	15'.1	10'.5	
258° 06'.4	08'.8	331° 02'.7	13'.8	04'.6	10'.6	
273° 06'.2	09'.3	345° 35'.5	13'.7	0° 06'.0 S	10'.5	56'.0
288° 05'.9	09'.7	0° 08'.2	13'.7	16'.5	10'.6	
303° 05'.7	10'.2	14° 40'.9	13'.7	27'.1	10'.5	
318° 05'.5	10'.6	29° 13'.6	13'.6	37'.6	10'.6	56'.1
333° 05'.3	11'.1	43° 46'.2	13'.6	48'.2	10'.6	
348° 05'.1	11'.5	58° 18'.8	13'.6	58'.8	10'.6	
3° 04'.9	21° 12'.0 S	72° 51'.4	13'.5	1° 09'.4 S	10'.6	56'.2
18° 04'.7	12'.4	87° 23'.9	13'.5	20'.0	10'.6	
33° 04'.5	12'.9	101° 56'.4	13'.4	30'.6	10'.6	
48° 04'.3	13'.3	116° 28'.8	13'.4	41'.2	10'.6	56'.3
63° 04'.1	13'.8	131° 01'.2	13'.3	51'.8	10'.6	
78° 03'.9	14'.2	145° 33'.5	13'.3	2° 02'.4 S	10'.6	
93° 03'.7	14'.7	160° 05'.8	13'.2	13'.0	10'.7	56'.4
108° 03'.4	15'.1	174° 38'.0	13'.2	23'.7	10'.6	
123° 03'.2	15'.6	189° 10'.2	13'.2	34'.3	10'.6	
138° 03'.0	16'.0	203° 42'.4	13'.1	44'.9	10'.7	56'.5
153° 02'.8	16'.5	218° 14'.5	13'.0	55'.6	10'.6	
168° 02'.6	16'.9	232° 46'.5	13'.0	3° 06'.2 S	10'.6	56'.6
183° 02'.4	21° 17'.3 S	247° 18'.5	13'.0	3° 16'.8 S	10'.7	56'.6
198° 02'.2	17'.8	261° 50'.5	12'.9	27'.5	10'.6	
213° 02'.0	18'.2	276° 22'.4	12'.8	38'.1	10'.6	56'.7
228° 01'.8	18'.7	290° 54'.2	12'.8	48'.7	10'.7	
243° 01'.5	19'.1	305° 26'.0	12'.8	59'.4	10'.6	
258° 01'.3	19'.5	319° 57'.8	12'.7	4° 10'.0 S	10'.6	56'.8
273° 01'.1	20'.0	334° 29'.5	12'.6	20'.6	10'.6	
288° 00'.9	20'.4	349° 01'.1	12'.5	31'.2	10'.6	
303° 00'.7	20'.8	3° 32'.6	12'.6	41'.8	10'.6	56'.9
318° 00'.5	21'.3	18° 04'.2	12'.4	52'.4	10'.6	
333° 00'.3	21'.7	32° 35'.6	12'.4	5° 03'.0 S	10'.6	57'.0
348° 00'.1	22'.1	47° 07'.0	12'.3	13'.6	10'.5	
2° 59'.8	21° 22'.6 S	61° 38'.3	12'.3	5° 24'.1 S	10'.6	57'.0
17° 59'.6	23'.0	76° 09'.6	12'.2	34'.7	10'.5	57'.1
32° 59'.4	23'.4	90° 40'.8	12'.2	45'.2	10'.6	
47° 59'.2	23'.9	105° 12'.0	12'.0	55'.8	10'.5	
62° 59'.0	24'.3	119° 43'.0	12'.1	6° 06'.3 S	10'.5	57'.2
77° 58'.8	24'.7	134° 14'.1	11'.9	16'.8	10'.5	
92° 58'.5	25'.2	148° 45'.0	11'.9	27'.3	10'.4	57'.3
107° 58'.3	25'.6	163° 15'.9	11'.8	37'.7	10'.5	
122° 58'.1	26'.0	177° 46'.7	11'.8	48'.2	10'.4	
137° 57'.9	26'.4	192° 17'.5	11'.6	58'.6	10'.4	57'.4
152° 57'.7	26'.9	206° 48'.1	11'.6	7° 09'.0 S	10'.4	
167° 57'.5	27'.3	221° 18'.7	11'.6	19'.4	10'.3	
182° 57'.2	21° 27'.7 S	235° 49'.3	11'.5	7° 29'.7 S	10'.4	57'.5
197° 57'.0	28'.1	250° 19'.8	11'.4	40'.1	10'.3	
212° 56'.8	28'.6	264° 50'.2	11'.3	50'.4	10'.3	57'.6
227° 56'.6	29'.0	279° 20'.5	11'.2	8° 00'.7 S	10'.2	
242° 56'.4	29'.4	293° 50'.7	11'.2	10'.9	10'.3	
257° 56'.1	29'.8	308° 20'.9	11'.1	21'.2	10'.2	57'.7
272° 55'.9	30'.2	322° 51'.0	11'.1	31'.4	10'.1	
287° 55'.7	30'.7	337° 21'.1	10'.9	41'.5	10'.2	57'.8
302° 55'.5	31'.1	351° 51'.0	10'.9	51'.7	10'.1	
317° 55'.2	31'.5	6° 20'.9	10'.8	9° 01'.8 S	10'.1	
332° 55'.0	31'.9	20° 50'.7	10'.7	11'.9	10'.0	57'.9
347° 54'.8	32'.3	35° 20'.4	10'.7	21'.9	10'.0	
2° 54'.6	21° 32'.8 S	49° 50'.1	10'.5	9° 31'.9 S	10'.0	58'.0
17° 54'.4	33'.2	64° 19'.6	10'.5	41'.9	9'.9	
32° 54'.1	33'.6	78° 49'.1	10'.4	51'.8	9'.9	
47° 53'.9	34'.0	93° 18'.5	10'.4	10° 01'.7 S	9'.9	58'.1
62° 53'.7	34'.4	107° 47'.9	10'.2	11'.6	9'.8	
77° 53'.5	34'.8	122° 17'.1	10'.2	21'.4	9'.7	
92° 53'.2	35'.2	136° 46'.3	10'.1	31'.1	9'.8	58'.2
107° 53'.0	35'.6	151° 15'.4	10'.0	40'.9	9'.6	
122° 52'.8	36'.1	165° 44'.4	9'.9	50'.5	9'.7	58'.3
137° 52'.6	36'.5	180° 13'.3	9'.8	11° 00'.2 S	9'.6	
152° 52'.3	36'.9	194° 42'.1	9'.8	09'.8	9'.5	
167° 52'.1	37'.3	209° 10'.9	9'.6	19'.3	9'.5	58'.4
SD 16'.2	d 0'.4	SD	15'.3	15'.5	15'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29
N 72°	07:43	09:37	-	00:39	02:23	04:13
N 70°	07:28	09:01	-	00:40	02:17	03:59
68°	07:15	08:36	10:20	00:41	02:13	03:49
66°	07:05	08:16	09:37	00:42	02:09	03:40
64°	06:56	08:00	09:08	00:42	02:06	03:33
62°	06:48	07:47	08:46	00:43	02:03	03:27
60°	06:41	07:36	08:29	00:43	02:01	03:21
N 58°	06:35	07:26	08:14	00:44	01:59	03:17
56°	06:29	07:17	08:02	00:44	01:57	03:12
54°	06:24	07:09	07:51	00:44	01:55	03:09
52°	06:20	07:02	07:41	00:45	01:54	03:05
50°	06:15	06:56	07:33	00:45	01:52	03:02
45°	06:05	06:42	07:14	00:46	01:49	02:56
N 40°	05:56	06:30	07:00	00:46	01:47	02:50
35°	05:48	06:19	06:47	00:46	01:45	02:45
30°	05:41	06:10	06:36	00:47	01:43	02:41
20°	05:26	05:53	06:17	00:47	01:40	02:34
N 10°	05:12	05:38	06:00	00:48	01:37	02:28
0°	04:56	05:22	05:44	00:49	01:34	02:22
S 10°	04:39	05:06	05:28	00:49	01:32	02:16
20°	04:19	04:47	05:11	00:50	01:29	02:10
30°	03:52	04:25	04:52	00:51	01:26	02:03
35°	03:36	04:11	04:40	00:51	01:24	01:59
40°	03:15	03:55	04:26	00:52	01:22	01:55
45°	02:48	03:35	04:10	00:52	01:20	01:50
S 50°	02:11	03:09	03:51	00:53	01:17	01:43
52°	01:50	02:56	03:41	00:53	01:16	01:41
54°	01:22	02:41	03:31	00:54	01:15	01:38
56°	00:37	02:23	03:19	00:54	01:13	01:34
58°	-	02:01	03:05	00:54	01:11	01:30
S 60°	-	01:31	02:48	00:55	01:10	01:26
S 62°	-	00:42	02:28	00:55	01:08	01:21

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 27	Moonset 28	Moonset 29
N 72°	-	13:59	15:52	12:53	12:44	12:34
N 70°	-	14:34	16:08	12:54	12:52	12:49
68°	13:16	15:00	16:20	12:56	12:58	13:01
66°	13:59	15:19	16:31	12:57	13:03	13:11
64°	14:27	15:35	16:40	12:58	13:08	13:19
62°	14:49	15:49	16:47	12:59	13:12	13:27
60°	15:07	16:00	16:54	13:00	13:16	13:33
N 58°	15:21	16:10	17:00	13:01	13:19	13:39
56°	15:34	16:19	17:06	13:02	13:21	13:44
54°	15:45	16:26	17:11	13:02	13:24	13:48
52°	15:54	16:34	17:16	13:03	13:26	13:52
50°	16:03	16:40	17:21	13:03	13:28	13:56
45°	16:21	16:54	17:31	13:05	13:33	14:04
N 40°	16:36	17:06	17:39	13:05	13:37	14:11
35°	16:49	17:16	17:48	13:06	13:40	14:16
30°	17:00	17:26	17:55	13:07	13:43	14:22
20°	17:19	17:43	18:10	13:08	13:48	14:31
N 10°	17:36	17:58	18:24	13:09	13:52	14:38
0°	17:52	18:14	18:40	13:10	13:57	14:46
S 10°	18:08	18:30	18:57	13:11	14:01	14:53
20°	18:25	18:49	19:18	13:12	14:05	15:01
30°	18:45	19:12	19:44	13:13	14:10	15:10
35°	18:56	19:25	20:01	13:14	14:13	15:15
40°	19:10	19:42	20:22	13:15	14:17	15:21
45°	19:26	20:02	20:49	13:16	14:21	15:28
S 50°	19:46	20:28	21:27	13:17	14:25	15:36
52°	19:56	20:41	21:48	13:17	14:27	15:40
54°	20:06	20:56	22:16	13:18	14:30	15:44
56°	20:18	21:14	23:05	13:18	14:32	15:49
58°	20:33	21:37	-	13:19	14:35	15:54
S 60°	20:50	22:07	-	13:20	14:38	16:00
S 62°	21:10	23:00	-	13:21	14:42	16:07

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
27	12 30	12 20	11:48	06:59	19:22	24d 34%
28	12 10	12 00	11:48	07:45	20:09	25d 24%
29	11 49	11 39	11:48	08:34	20:59	26d 16%

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2013 Nov 30, Dec. 1, 2 (Sat, Sun, Mon)

GMT	ARIES	VENUS -4.6		MARS +1.2		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
30 Saturday 00	69° 01'.8	136° 02'.9	24° 49'.8 S	252° 04'.8	3° 19'.2 N	317° 45'.1	22° 02'.5 N	203° 51'.3	14° 52'.8 S
01	84° 04'.3	151° 03'.6	49'.3	267° 06'.1	18'.7	332° 47'.7	02'.5	218° 53'.4	52'.9
02	99° 06'.7	166° 04'.3	48'.8	282° 07'.3	18'.2	347° 50'.4	02'.6	233° 55'.6	52'.9
03	114° 09'.2	181° 05'.0	48'.4	297° 08'.5	17'.7	2° 53'.1	02'.6	248° 57'.8	53'.0
04	129° 11'.7	196° 05'.7	47'.9	312° 09'.7	17'.2	17° 55'.7	02'.6	264° 00'.0	53'.1
05	144° 14'.1	211° 06'.4	47'.5	327° 11'.0	16'.7	32° 58'.4	02'.7	279° 02'.2	53'.2
06	159° 16'.6	226° 07'.1	47'.0	342° 12'.2	16'.1	48° 01'.0	02'.7	294° 04'.3	53'.3
07	174° 19'.0	241° 07'.8	46'.6	357° 13'.4	15'.6	63° 03'.7	02'.7	309° 06'.5	53'.3
08	189° 21'.5	256° 08'.5	46'.1	12° 14'.7	15'.1	78° 06'.4	02'.8	324° 08'.7	53'.4
09	204° 24'.0	271° 09'.2	45'.7	27° 15'.9	14'.6	93° 09'.0	02'.8	339° 10'.9	53'.5
10	219° 26'.4	286° 09'.9	45'.2	42° 17'.1	14'.1	108° 11'.7	02'.8	354° 13'.1	53'.6
11	234° 28'.9	301° 10'.7	44'.7	57° 18'.4	13'.6	123° 14'.4	02'.9	9° 15'.2	53'.6
12	249° 31'.4	316° 11'.4	24° 44'.3 S	72° 19'.6	3° 13'.1 N	138° 17'.0	22° 02'.9 N	24° 17'.4	14° 53'.7 S
13	264° 33'.8	331° 12'.1	43'.8	87° 20'.9	12'.6	153° 19'.7	02'.9	39° 19'.6	53'.8
14	279° 36'.3	346° 12'.8	43'.4	102° 22'.1	12'.1	168° 22'.4	03'.0	54° 21'.8	53'.9
15	294° 38'.8	1° 13'.5	42'.9	117° 23'.3	11'.6	183° 25'.0	03'.0	69° 23'.9	54'.0
16	309° 41'.2	16° 14'.3	42'.4	132° 24'.6	11'.1	198° 27'.7	03'.0	84° 26'.1	54'.0
17	324° 43'.7	31° 15'.0	42'.0	147° 25'.8	10'.6	213° 30'.3	03'.1	99° 28'.3	54'.1
18	339° 46'.2	46° 15'.7	41'.5	162° 27'.0	10'.1	228° 33'.0	03'.1	114° 30'.5	54'.2
19	354° 48'.6	61° 16'.5	41'.0	177° 28'.3	09'.6	243° 35'.7	03'.1	129° 32'.7	54'.3
20	9° 51'.1	76° 17'.2	40'.6	192° 29'.5	09'.1	258° 38'.3	03'.2	144° 34'.8	54'.4
21	24° 53'.5	91° 17'.9	40'.1	207° 30'.7	08'.6	273° 41'.0	03'.2	159° 37'.0	54'.4
22	39° 56'.0	106° 18'.7	39'.7	222° 32'.0	08'.1	288° 43'.7	03'.2	174° 39'.2	54'.5
23	54° 58'.5	121° 19'.4	39'.2	237° 33'.2	07'.6	303° 46'.3	03'.3	189° 41'.4	54'.6
1 Sunday 00	70° 00'.9	136° 20'.2	24° 38'.7 S	252° 34'.4	3° 07'.1 N	318° 49'.0	22° 03'.3 N	204° 43'.6	14° 54'.7 S
01	85° 03'.4	151° 20'.9	38'.3	267° 35'.7	06'.6	333° 51'.7	03'.3	219° 45'.7	54'.7
02	100° 05'.9	166° 21'.7	37'.8	282° 36'.9	06'.1	348° 54'.4	03'.4	234° 47'.9	54'.8
03	115° 08'.3	181° 22'.4	37'.3	297° 38'.2	05'.6	3° 57'.0	03'.4	249° 50'.1	54'.9
04	130° 10'.8	196° 23'.2	36'.9	312° 39'.4	05'.1	18° 59'.7	03'.4	264° 52'.3	55'.0
05	145° 13'.3	211° 24'.0	36'.4	327° 40'.6	04'.6	34° 02'.4	03'.5	279° 54'.5	55'.1
06	160° 15'.7	226° 24'.7	35'.9	342° 41'.9	04'.0	49° 05'.0	03'.5	294° 56'.6	55'.1
07	175° 18'.2	241° 25'.5	35'.5	357° 43'.1	03'.5	64° 07'.7	03'.5	309° 58'.8	55'.2
08	190° 20'.7	256° 26'.3	35'.0	12° 44'.3	03'.0	79° 10'.4	03'.6	325° 01'.0	55'.3
09	205° 23'.1	271° 27'.0	34'.5	27° 45'.6	02'.5	94° 13'.0	03'.6	340° 03'.2	55'.4
10	220° 25'.6	286° 27'.8	34'.0	42° 46'.8	02'.0	109° 15'.7	03'.6	355° 05'.4	55'.4
11	235° 28'.0	301° 28'.6	33'.6	57° 48'.1	01'.5	124° 18'.4	03'.7	10° 07'.5	55'.5
12	250° 30'.5	316° 29'.4	24° 33'.1 S	72° 49'.3	3° 01'.0 N	139° 21'.1	22° 03'.7 N	25° 09'.7	14° 55'.6 S
13	265° 33'.0	331° 30'.1	32'.6	87° 50'.5	00'.5	154° 23'.7	03'.7	40° 11'.9	55'.7
14	280° 35'.4	346° 30'.9	32'.2	102° 51'.8	00'.0	169° 26'.4	03'.8	55° 14'.1	55'.8
15	295° 37'.9	1° 31'.7	31'.7	117° 53'.0	2° 59'.5 N	184° 29'.1	03'.8	70° 16'.3	55'.8
16	310° 40'.4	16° 32'.5	31'.2	132° 54'.3	59'.0	199° 31'.7	03'.8	85° 18'.4	55'.9
17	325° 42'.8	31° 33'.3	30'.7	147° 55'.5	58'.5	214° 34'.4	03'.9	100° 20'.6	56'.0
18	340° 45'.3	46° 34'.1	30'.3	162° 56'.7	58'.0	229° 37'.1	03'.9	115° 22'.8	56'.1
19	355° 47'.8	61° 34'.9	29'.8	177° 58'.0	57'.5	244° 39'.8	03'.9	130° 25'.0	56'.1
20	10° 50'.2	76° 35'.7	29'.3	192° 59'.2	57'.0	259° 42'.4	04'.0	145° 27'.2	56'.2
21	25° 52'.7	91° 36'.5	28'.8	208° 00'.5	56'.5	274° 45'.1	04'.0	160° 29'.3	56'.3
22	40° 55'.2	106° 37'.3	28'.4	223° 01'.7	56'.0	289° 47'.8	04'.0	175° 31'.5	56'.4
23	55° 57'.6	121° 38'.1	27'.9	238° 02'.9	55'.5	304° 50'.5	04'.1	190° 33'.7	56'.5
2 Monday 00	71° 00'.1	136° 38'.9	24° 27'.4 S	253° 04'.2	2° 55'.0 N	319° 53'.1	22° 04'.1 N	205° 35'.9	14° 56'.5 S
01	86° 02'.5	151° 39'.7	26'.9	268° 05'.4	54'.5	334° 55'.8	04'.1	220° 38'.1	56'.6
02	101° 05'.0	166° 40'.6	26'.5	283° 06'.7	54'.0	349° 58'.5	04'.2	235° 40'.2	56'.7
03	116° 07'.5	181° 41'.4	26'.0	298° 07'.9	53'.5	5° 01'.2	04'.2	250° 42'.4	56'.8
04	131° 09'.9	196° 42'.2	25'.5	313° 09'.2	53'.0	20° 03'.8	04'.2	265° 44'.6	56'.8
05	146° 12'.4	211° 43'.0	25'.0	328° 10'.4	52'.5	35° 06'.5	04'.3	280° 46'.8	56'.9
06	161° 14'.9	226° 43'.9	24'.5	343° 11'.6	52'.0	50° 09'.2	04'.3	295° 49'.0	57'.0
07	176° 17'.3	241° 44'.7	24'.1	358° 12'.9	51'.5	65° 11'.9	04'.3	310° 51'.1	57'.1
08	191° 19'.8	256° 45'.5	23'.6	13° 14'.1	51'.0	80° 14'.6	04'.4	325° 53'.3	57'.1
09	206° 22'.3	271° 46'.4	23'.1	28° 15'.4	50'.5	95° 17'.2	04'.4	340° 55'.5	57'.2
10	221° 24'.7	286° 47'.2	22'.6	43° 16'.6	50'.0	110° 19'.9	04'.5	355° 57'.7	57'.3
11	236° 27'.2	301° 48'.0	22'.1	58° 17'.9	49'.5	125° 22'.6	04'.5	10° 59'.9	57'.4
12	251° 29'.6	316° 48'.9	24° 21'.7 S	73° 19'.1	2° 49'.0 N	140° 25'.3	22° 04'.5 N	26° 02'.1	14° 57'.5 S
13	266° 32'.1	331° 49'.7	21'.2	88° 20'.4	48'.5	155° 27'.9	04'.6	41° 04'.2	57'.5
14	281° 34'.6	346° 50'.6	20'.7	103° 21'.6	48'.0	170° 30'.6	04'.6	56° 06'.4	57'.6
15	296° 37'.0	1° 51'.4	20'.2	118° 22'.8	47'.5	185° 33'.3	04'.6	71° 08'.6	57'.7
16	311° 39'.5	16° 52'.3	19'.7	133° 24'.1	47'.0	200° 36'.0	04'.7	86° 10'.8	57'.8
17	326° 42'.0	31° 53'.1	19'.2	148° 25'.3	46'.5	215° 38'.7	04'.7	101° 13'.0	57'.8
18	341° 44'.4	46° 54'.0	18'.8	163° 26'.6	46'.0	230° 41'.4	04'.7	116° 15'.1	57'.9
19	356° 46'.9	61° 54'.9	18'.3	178° 27'.8	45'.5	245° 44'.0	04'.8	131° 17'.3	58'.0
20	11° 49'.4	76° 55'.7	17'.8	193° 29'.1	45'.0	260° 46'.7	04'.8	146° 19'.5	58'.1
21	26° 51'.8	91° 56'.6	17'.3	208° 30'.3	44'.5	275° 49'.4	04'.8	161° 21'.7	58'.1
22	41° 54'.3	106° 57'.5	16'.8	223° 31'.6	44'.0	290° 52'.1	04'.9	176° 23'.9	58'.2
23	56° 56'.8	121° 58'.3	16'.3	238° 32'.8	43'.5	305° 54'.8	04'.9	191° 26'.0	58'.3
	M.P. 19:17	v 0'.8	d 0'.5	v 1'.2	d 0'.5	v 2'.7	d 0'.0	v 2'.2	d 0'.1

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 17'.7	40° 15'.1 S	182° 51'.9	21° 37'.7 S	223° 39'.5	9'.6	11° 28'.8 S	9'.4	58'.4
Achernar	335° 26'.2	57° 10'.2 S	197° 51'.7	38'.1	238° 08'.1	9'.5	38'.2	9'.4	58'.5
Acrux	173° 09'.2	63° 10'.3 S	212° 51'.4	38'.5	252° 36'.6	9'.4	47'.6	9'.3	
Adhara	255° 12'.0	28° 59'.5 S	227° 51'.2	38'.9	267° 05'.0	9'.3	56'.9	9'.3	
Aldebaran	290° 48'.7	16° 32'.1 N	242° 51'.0	39'.3	281° 33'.3	9'.3	12° 06'.2 S	9'.2	58'.6
			257° 50'.8	39'.7	296° 01'.6	9'.1	15'.4	9'.2	
Alioth	166° 20'.8	55° 52'.8 N	272° 50'.5	40'.1	310° 29'.7	9'.1	24'.6	9'.1	
Alkaid	152° 59'.1	49° 14'.5 N	287° 50'.3	40'.5	324° 57'.8	9'.0	33'.7	9'.0	58'.7
Alnair	27° 43'.5	46° 53'.7 S	302° 50'.1	40'.9	339° 25'.8	8'.8	42'.7	9'.0	
Alnilam	275° 45'.7	1° 11'.7 S	317° 49'.8	41'.3	353° 53'.6	8'.8	51'.7	8'.9	58'.8
Alphard	217° 55'.7	8° 43'.2 S	332° 49'.6	41'.7	8° 21'.4	8'.8	13° 00'.6 S	8'.8	
			347° 49'.4	42'.1	22° 49'.2	8'.6	09'.4	8'.8	
Alphecca	126° 11'.1	26° 40'.2 N	2° 49'.2	21° 42'.5 S	37° 16'.8	8'.5	13° 18'.2 S	8'.7	58'.9
Alpheratz	357° 43'.0	29° 10'.3 N	17° 48'.9	42'.9	51° 44'.3	8'.5	26'.9	8'.7	
Altair	62° 08'.2	8° 54'.6 N	32° 48'.7	43'.3	66° 11'.8	8'.3	35'.6	8'.5	
Ankaa	353° 15'.3	42° 14'.0 S	47° 48'.5	43'.7	80° 39'.1	8'.3	44'.1	8'.5	59'.0
Antares	112° 26'.2	26° 27'.6 S	62° 48'.2	44'.1	95° 06'.4	8'.2	52'.6	8'.5	
			77° 48'.0	44'.5	109° 33'.6	8'.1	14° 01'.1 S	8'.3	59'.1
Arcturus	145° 55'.8	19° 06'.6 N	92° 47'.8	44'.9	124° 00'.7	8'.0	09'.4	8'.3	
Atria	107° 28'.3	69° 03'.0 S	107° 47'.5	45'.3	138° 27'.7	7'.9	17'.7	8'.2	
Avior	234° 17'.4	59° 33'.2 S	122° 47'.3	45'.7	152° 54'.6	7'.8	25'.9	8'.1	59'.2
Bellatrix	278° 31'.3	6° 21'.6 N	137° 47'.1	46'.1	167° 21'.4	7'.7	34'.0	8'.1	
Betelgeuse	271° 00'.6	7° 24'.4 N	152° 46'.8	46'.5	181° 48'.1	7'.7	42'.1	7'.9	
			167° 46'.6	46'.9	196° 14'.8	7'.5	50'.0	7'.9	59'.3
Canopus	263° 55'.5	52° 42'.2 S	182° 46'.4	21° 47'.3 S	210° 41'.3	7'.5	14° 57'.9 S	7'.8	59'.3
Capella	280° 33'.5	46° 00'.5 N	197° 46'.1	47'.6	225° 07'.8	7'.4	15° 05'.7 S	7'.7	
Deneb	49° 31'.5	45° 20'.2 N	212° 45'.9	48'.0	239° 34'.2	7'.3	13'.4	7'.6	59'.4
Denebola	182° 33'.5	14° 29'.6 N	227° 45'.7	48'.4	254° 00'.5	7'.2	21'.0	7'.6	
Diphda	348° 55'.4	17° 54'.6 S	242° 45'.4	48'.8	268° 26'.7	7'.1	28'.6	7'.4	
			257° 45'.2	49'.2	282° 52'.8	7'.0	36'.0	7'.4	59'.5
Dubhe	193° 51'.5	61° 40'.2 N	272° 45'.0	49'.6	297° 18'.8	7'.0	43'.4	7'.2	
Elnath	278° 11'.8	28° 37'.0 N	287° 44'.7	50'.0	311° 44'.8	6'.9	50'.6	7'.2	
Eltanin	90° 46'.5	51° 29'.5 N	302° 44'.5	50'.4	326° 10'.7	6'.7	57'.8	7'.1	59'.6
Enif	33° 46'.9	9° 56'.6 N	317° 44'.3	50'.7	340° 36'.4	6'.7	16° 04'.9 S	7'.0	
Fomalhaut	15° 23'.7	29° 32'.9 S	332° 44'.0	51'.1	355° 02'.1	6'.6	11'.9	6'.9	
			347° 43'.8	51'.5	9° 27'.7	6'.5	18'.8	6'.7	59'.7
Gacrux	172° 00'.7	57° 11'.2 S	2° 43'.6	21° 51'.9 S	23° 53'.2	6'.5	16° 25'.5 S	6'.7	59'.7
Gienah	175° 52'.1	17° 37'.1 S	17° 43'.3	52'.3	38° 18'.7	6'.3	32'.2	6'.6	
Hadar	148° 47'.9	60° 26'.1 S	32° 43'.1	52'.6	52° 44'.0	6'.3	38'.8	6'.5	59'.8
Hamal	328° 00'.1	23° 31'.8 N	47° 42'.8	53'.0	67° 09'.3	6'.2	45'.3	6'.4	
Kaus Aust.	83° 43'.8	34° 22'.5 S	62° 42'.6	53'.4	81° 34'.5	6'.1	51'.7	6'.2	
			77° 42'.4	53'.8	95° 59'.6	6'.0	57'.9	6'.2	59'.9
Kochab	137° 21'.3	74° 05'.8 N	92° 42'.1	54'.2	110° 24'.6	6'.0	17° 04'.1 S	6'.0	
Markab	13° 38'.0	15° 17'.0 N	107° 41'.9	54'.5	124° 49'.6	5'.8	10'.1	6'.0	
Menkar	314° 14'.4	4° 08'.6 N	122° 41'.7	54'.9	139° 14'.4	5'.8	16'.1	5'.8	
Menkent	148° 07'.5	36° 26'.1 S	137° 41'.4	55'.3	153° 39'.2	5'.7	21'.9	5'.7	60'.0
Miaplacidus	221° 39'.1	69° 46'.3 S	152° 41'.2	55'.7	168° 03'.9	5'.7	27'.6	5'.7	
			167° 40'.9	56'.0	182° 28'.6	5'.5	33'.3	5'.5	
Mirfak	308° 39'.4	49° 54'.6 N	182° 40'.7	21° 56'.4 S	196° 53'.1	5'.5	17° 38'.8 S	5'.3	60'.1
Nunki	75° 58'.3	26° 16'.6 S	197° 40'.5	56'.8	211° 17'.6	5'.4	44'.1	5'.3	
Peacock	53° 19'.2	56° 41'.4 S	212° 40'.2	57'.1	225° 42'.0	5'.4	49'.4	5'.1	
Polaris	317° 11'.1	89° 19'.5 N	227° 40'.0	57'.5	240° 06'.4	5'.3	54'.5	5'.1	
Pollux	243° 27'.1	27° 59'.3 N	242° 39'.7	57'.9	254° 30'.7	5'.2	59'.6	4'.9	60'.2
			257° 39'.5	58'.3	268° 54'.9	5'.1	18° 04'.5 S	4'.8	
Procyon	244° 59'.2	5° 11'.2 N	272° 39'.3	58'.6	283° 19'.0	5'.1	09'.3	4'.6	
Rasalhague	96° 06'.5	12° 33'.2 N	287° 39'.0	59'.0	297° 43'.1	5'.0	13'.9	4'.6	
Regulus	207° 43'.1	11° 53'.8 N	302° 38'.8	59'.4	312° 07'.1	4'.9	18'.5	4'.4	60'.3
Rigel	281° 11'.4	8° 11'.3 S	317° 38'.5	59'.7	326° 31'.0	4'.9	22'.9	4'.3	
Rigil Kent	139° 51'.8	60° 53'.3 S	332° 38'.3	22° 00'.1 S	340° 54'.9	4'.8	27'.2	4'.1	
			347° 38'.0	00'.5	355° 18'.7	4'.7	31'.3	4'.1	
Sabik	102° 12'.5	15° 44'.3 S	2° 37'.8	22° 00'.8 S	9° 42'.4	4'.7	18° 35'.4 S	3'.9	60'.4
Schedar	349° 39'.8	56° 37'.1 N	17° 37'.6	01'.2	24° 06'.1	4'.6	39'.3	3'.7	
Shaula	96° 21'.9	37° 06'.6 S	32° 37'.3	01'.5	38° 29'.7	4'.6	43'.0	3'.7	
Sirius	258° 33'.1	16° 44'.2 S	47° 37'.1	01'.9	52° 53'.3	4'.5	46'.7	3'.5	
Spica	158° 31'.1	11° 13'.9 S	62° 36'.8	02'.3	67° 16'.8	4'.5	50'.2	3'.4	
			77° 36'.6	02'.6	81° 40'.3	4'.4	53'.6	3'.2	60'.5
Suhail	222° 52'.0	43° 29'.2 S	92° 36'.3	03'.0	96° 03'.7	4'.3	56'.8	3'.1	
Vega	80° 39'.1	38° 48'.1 N	107° 36'.1	03'.3	110° 27'.0	4'.3	59'.9	3'.0	
Zuben'ubi	137° 05'.4	16° 05'.8 S	122° 35'.9	03'.7	124° 50'.3	4'.3	19° 02'.9 S	2'.9	
			137° 35'.6	04'.1	139° 13'.6	4'.2	05'.8	2'.7	
	SHA	Mer.Pass.	152° 35'.4	04'.4	153° 36'.8	4'.2	08'.5	2'.5	60'.6
Venus	66° 19'.2	14:54	167° 35'.1	04'.8	168° 00'.0	4'.1	11'.0	2'.5	
Mars	182° 33'.5	07:09							
Jupiter	248° 48'.1	02:44							
Saturn	134° 42'.6	10:20	SD 16'.2	d 0'.4	SD 16'.0		16'.3	16'.4	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 30	Moonrise 1	Moonrise 2
N 72°	07:51	09:51	-	06:12	08:29	-
N 70°	07:35	09:11	-	05:48	07:44	09:46
68°	07:22	08:44	10:37	05:30	07:15	08:58
66°	07:11	08:23	09:47	05:15	06:53	08:28
64°	07:01	08:07	09:16	05:03	06:36	08:05
62°	06:53	07:53	08:53	04:53	06:21	07:47
60°	06:46	07:41	08:35	04:45	06:09	07:32
N 58°	06:39	07:31	08:20	04:37	05:59	07:19
56°	06:34	07:21	08:07	04:31	05:50	07:08
54°	06:28	07:13	07:56	04:25	05:42	06:58
52°	06:23	07:06	07:46	04:19	05:35	06:50
50°	06:19	06:59	07:37	04:15	05:29	06:42
45°	06:08	06:45	07:18	04:04	05:15	06:26
N 40°	05:59	06:33	07:03	03:56	05:04	06:12
35°	05:51	06:22	06:50	03:49	04:54	06:01
30°	05:43	06:12	06:38	03:42	04:46	05:51
20°	05:28	05:55	06:19	03:31	04:31	05:34
N 10°	05:13	05:39	06:02	03:22	04:19	05:19
0°	04:57	05:23	05:45	03:13	04:07	05:05
S 10°	04:40	05:06	05:29	03:04	03:56	04:52
20°	04:19	04:47	05:12	02:54	03:43	04:37
30°	03:52	04:24	04:51	02:44	03:29	04:20
35°	03:34	04:10	04:39	02:38	03:21	04:11
40°	03:13	03:53	04:25	02:31	03:12	04:00
45°	02:46	03:33	04:09	02:23	03:01	03:47
S 50°	02:07	03:06	03:49	02:13	02:48	03:31
52°	01:44	02:53	03:39	02:09	02:42	03:24
54°	01:14	02:37	03:28	02:04	02:36	03:16
56°	00:16	02:19	03:15	01:59	02:28	03:07
58°	-	01:55	03:01	01:53	02:20	02:56
S 60°	-	01:22	02:43	01:46	02:11	02:45
S 62°	-	00:19	02:22	01:38	02:00	02:31

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 30	Moonset 1	Moonset 2
N 72°	-	13:47	15:46	12:21	11:59	-
N 70°	-	14:26	16:02	12:46	12:45	12:46
68°	13:01	14:54	16:16	13:06	13:15	13:34
66°	13:50	15:14	16:27	13:22	13:38	14:05
64°	14:21	15:31	16:36	13:34	13:56	14:29
62°	14:44	15:45	16:44	13:45	14:11	14:47
60°	15:03	15:57	16:52	13:55	14:23	15:02
N 58°	15:18	16:07	16:58	14:03	14:34	15:16
56°	15:31	16:16	17:04	14:10	14:44	15:27
54°	15:42	16:24	17:10	14:17	14:52	15:37
52°	15:52	16:32	17:15	14:23	15:00	15:46
50°	16:01	16:38	17:19	14:28	15:06	15:54
45°	16:20	16:53	17:30	14:39	15:21	16:10
N 40°	16:35	17:05	17:39	14:49	15:33	16:24
35°	16:48	17:16	17:47	14:57	15:43	16:36
30°	17:00	17:26	17:55	15:04	15:52	16:46
20°	17:19	17:43	18:10	15:17	16:08	17:04
N 10°	17:37	17:59	18:25	15:28	16:22	17:20
0°	17:53	18:15	18:41	15:38	16:34	17:34
S 10°	18:09	18:32	18:59	15:48	16:47	17:48
20°	18:27	18:51	19:20	16:00	17:01	18:04
30°	18:47	19:14	19:47	16:12	17:17	18:22
35°	18:59	19:28	20:04	16:20	17:26	18:32
40°	19:13	19:45	20:25	16:28	17:36	18:44
45°	19:30	20:06	20:53	16:38	17:48	18:58
S 50°	19:50	20:33	21:33	16:49	18:03	19:15
52°	20:00	20:46	21:55	16:55	18:10	19:23
54°	20:11	21:02	22:26	17:01	18:18	19:31
56°	20:24	21:21	23:35	17:08	18:27	19:41
58°	20:39	21:45	-	17:16	18:37	19:53
S 60°	20:56	22:19	-	17:24	18:48	20:06
S 62°	21:18	23:33	-	17:34	19:01	20:22

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
30	11 28	11 17	11:49	09:25	21:53	27d 9%
1	11 06	10 55	11:49	10:21	22:50	28d 3%
2	10 43	10 32	11:49	11:20	23:50	29d 0%

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2013 December 3, 4, 5 (Tue, Wed, Thur)

GMT	ARIES	VENUS -4.7		MARS +1.2		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
3 Tuesday 00	71° 59'.2	136° 59'.2	24° 15'.8 S	253° 34'.1	2° 43'.0 N	320° 57'.4	22° 04'.9 N	206° 28'.2	14° 58'.4 S
01	87° 01'.7	152° 00'.1	15'.3	268° 35'.3	42'.5	336° 00'.1	05'.0	221° 30'.4	58'.5
02	102° 04'.1	167° 01'.0	14'.9	283° 36'.6	42'.0	351° 02'.8	05'.0	236° 32'.6	58'.5
03	117° 06'.6	182° 01'.9	14'.4	298° 37'.8	41'.5	6° 05'.5	05'.0	251° 34'.8	58'.6
04	132° 09'.1	197° 02'.8	13'.9	313° 39'.0	41'.0	21° 08'.2	05'.1	266° 37'.0	58'.7
05	147° 11'.5	212° 03'.6	13'.4	328° 40'.3	40'.5	36° 10'.9	05'.1	281° 39'.1	58'.8
06	162° 14'.0	227° 04'.5	12'.9	343° 41'.5	40'.0	51° 13'.5	05'.2	296° 41'.3	58'.8
07	177° 16'.5	242° 05'.4	12'.4	358° 42'.8	39'.5	66° 16'.2	05'.2	311° 43'.5	58'.9
08	192° 18'.9	257° 06'.3	11'.9	13° 44'.0	39'.0	81° 18'.9	05'.2	326° 45'.7	59'.0
09	207° 21'.4	272° 07'.2	11'.4	28° 45'.3	38'.5	96° 21'.6	05'.3	341° 47'.9	59'.1
10	222° 23'.9	287° 08'.1	10'.9	43° 46'.5	38'.0	111° 24'.3	05'.3	356° 50'.1	59'.1
11	237° 26'.3	302° 09'.0	10'.4	58° 47'.8	37'.5	126° 27'.0	05'.3	11° 52'.2	59'.2
12	252° 28'.8	317° 10'.0	24° 10'.0 S	73° 49'.0	2° 37'.0 N	141° 29'.7	22° 05'.4 N	26° 54'.4	14° 59'.3 S
13	267° 31'.3	332° 10'.9	09'.5	88° 50'.3	36'.5	156° 32'.4	05'.4	41° 56'.6	59'.4
14	282° 33'.7	347° 11'.8	09'.0	103° 51'.5	36'.0	171° 35'.0	05'.4	56° 58'.8	59'.5
15	297° 36'.2	2° 12'.7	08'.5	118° 52'.8	35'.5	186° 37'.7	05'.5	72° 01'.0	59'.5
16	312° 38'.6	17° 13'.6	08'.0	133° 54'.0	35'.0	201° 40'.4	05'.5	87° 03'.1	59'.6
17	327° 41'.1	32° 14'.5	07'.5	148° 55'.3	34'.5	216° 43'.1	05'.5	102° 05'.3	59'.7
18	342° 43'.6	47° 15'.5	07'.0	163° 56'.5	34'.0	231° 45'.8	05'.6	117° 07'.5	59'.8
19	357° 46'.0	62° 16'.4	06'.5	178° 57'.8	33'.5	246° 48'.5	05'.6	132° 09'.7	59'.8
20	12° 48'.5	77° 17'.3	06'.0	193° 59'.0	33'.0	261° 51'.2	05'.7	147° 11'.9	59'.9
21	27° 51'.0	92° 18'.3	05'.5	209° 00'.3	32'.5	276° 53'.9	05'.7	162° 14'.1	15° 00'.0 S
22	42° 53'.4	107° 19'.2	05'.0	224° 01'.5	32'.0	291° 56'.6	05'.7	177° 16'.2	00'.1
23	57° 55'.9	122° 20'.2	04'.5	239° 02'.8	31'.5	306° 59'.2	05'.8	192° 18'.4	00'.1
4 Wednesday 00	72° 58'.4	137° 21'.1	24° 04'.0 S	254° 04'.0	2° 31'.0 N	322° 01'.9	22° 05'.8 N	207° 20'.6	15° 00'.2 S
01	88° 00'.8	152° 22'.0	03'.5	269° 05'.3	30'.5	337° 04'.6	05'.8	222° 22'.8	00'.3
02	103° 03'.3	167° 23'.0	03'.0	284° 06'.6	30'.0	352° 07'.3	05'.9	237° 25'.0	00'.4
03	118° 05'.8	182° 24'.0	02'.5	299° 07'.8	29'.5	7° 10'.0	05'.9	252° 27'.2	00'.4
04	133° 08'.2	197° 24'.9	02'.0	314° 09'.1	29'.0	22° 12'.7	05'.9	267° 29'.3	00'.5
05	148° 10'.7	212° 25'.9	01'.5	329° 10'.3	28'.5	37° 15'.4	06'.0	282° 31'.5	00'.6
06	163° 13'.1	227° 26'.8	01'.0	344° 11'.6	28'.0	52° 18'.1	06'.0	297° 33'.7	00'.7
07	178° 15'.6	242° 27'.8	00'.5	359° 12'.8	27'.5	67° 20'.8	06'.1	312° 35'.9	00'.7
08	193° 18'.1	257° 28'.8	00'.0	14° 14'.1	27'.1	82° 23'.5	06'.1	327° 38'.1	00'.8
09	208° 20'.5	272° 29'.7	23° 59'.5 S	29° 15'.3	26'.6	97° 26'.2	06'.1	342° 40'.3	00'.9
10	223° 23'.0	287° 30'.7	59'.0	44° 16'.6	26'.1	112° 28'.9	06'.2	357° 42'.4	01'.0
11	238° 25'.5	302° 31'.7	58'.5	59° 17'.8	25'.6	127° 31'.6	06'.2	12° 44'.6	01'.1
12	253° 27'.9	317° 32'.7	23° 58'.0 S	74° 19'.1	2° 25'.1 N	142° 34'.2	22° 06'.2 N	27° 46'.8	15° 01'.1 S
13	268° 30'.4	332° 33'.6	57'.5	89° 20'.3	24'.6	157° 36'.9	06'.3	42° 49'.0	01'.2
14	283° 32'.9	347° 34'.6	57'.0	104° 21'.6	24'.1	172° 39'.6	06'.3	57° 51'.2	01'.3
15	298° 35'.3	2° 35'.6	56'.5	119° 22'.9	23'.6	187° 42'.3	06'.3	72° 53'.4	01'.4
16	313° 37'.8	17° 36'.6	56'.0	134° 24'.1	23'.1	202° 45'.0	06'.4	87° 55'.5	01'.4
17	328° 40'.3	32° 37'.6	55'.5	149° 25'.4	22'.6	217° 47'.7	06'.4	102° 57'.7	01'.5
18	343° 42'.7	47° 38'.6	55'.0	164° 26'.6	22'.1	232° 50'.4	06'.5	117° 59'.9	01'.6
19	358° 45'.2	62° 39'.6	54'.5	179° 27'.9	21'.6	247° 53'.1	06'.5	133° 02'.1	01'.7
20	13° 47'.6	77° 40'.6	54'.0	194° 29'.1	21'.1	262° 55'.8	06'.5	148° 04'.3	01'.7
21	28° 50'.1	92° 41'.6	53'.5	209° 30'.4	20'.6	277° 58'.5	06'.6	163° 06'.5	01'.8
22	43° 52'.6	107° 42'.6	53'.0	224° 31'.7	20'.1	293° 01'.2	06'.6	178° 08'.6	01'.9
23	58° 55'.0	122° 43'.6	52'.5	239° 32'.9	19'.6	308° 03'.9	06'.6	193° 10'.8	02'.0
5 Thursday 00	73° 57'.5	137° 44'.6	23° 52'.0 S	254° 34'.2	2° 19'.1 N	323° 06'.6	22° 06'.7 N	208° 13'.0	15° 02'.0 S
01	89° 00'.0	152° 45'.7	51'.5	269° 35'.4	18'.6	338° 09'.3	06'.7	223° 15'.2	02'.1
02	104° 02'.4	167° 46'.7	51'.0	284° 36'.7	18'.1	353° 12'.0	06'.8	238° 17'.4	02'.2
03	119° 04'.9	182° 47'.7	50'.4	299° 37'.9	17'.6	8° 14'.7	06'.8	253° 19'.6	02'.3
04	134° 07'.4	197° 48'.7	49'.9	314° 39'.2	17'.1	23° 17'.4	06'.8	268° 21'.7	02'.3
05	149° 09'.8	212° 49'.8	49'.4	329° 40'.5	16'.6	38° 20'.1	06'.9	283° 23'.9	02'.4
06	164° 12'.3	227° 50'.8	48'.9	344° 41'.7	16'.1	53° 22'.8	06'.9	298° 26'.1	02'.5
07	179° 14'.8	242° 51'.8	48'.4	359° 43'.0	15'.7	68° 25'.5	06'.9	313° 28'.3	02'.6
08	194° 17'.2	257° 52'.9	47'.9	14° 44'.2	15'.2	83° 28'.2	07'.0	328° 30'.5	02'.6
09	209° 19'.7	272° 53'.9	47'.4	29° 45'.5	14'.7	98° 30'.9	07'.0	343° 32'.7	02'.7
10	224° 22'.1	287° 55'.0	46'.9	44° 46'.8	14'.2	113° 33'.6	07'.1	358° 34'.9	02'.8
11	239° 24'.6	302° 56'.0	46'.4	59° 48'.0	13'.7	128° 36'.3	07'.1	13° 37'.0	02'.9
12	254° 27'.1	317° 57'.1	23° 45'.9 S	74° 49'.3	2° 13'.2 N	143° 39'.0	22° 07'.1 N	28° 39'.2	15° 02'.9 S
13	269° 29'.5	332° 58'.1	45'.4	89° 50'.5	12'.7	158° 41'.7	07'.2	43° 41'.4	03'.0
14	284° 32'.0	347° 59'.2	44'.8	104° 51'.8	12'.2	173° 44'.4	07'.2	58° 43'.6	03'.1
15	299° 34'.5	3° 00'.2	44'.3	119° 53'.1	11'.7	188° 47'.1	07'.2	73° 45'.8	03'.2
16	314° 36'.9	18° 01'.3	43'.8	134° 54'.3	11'.2	203° 49'.8	07'.3	88° 48'.0	03'.2
17	329° 39'.4	33° 02'.4	43'.3	149° 55'.6	10'.7	218° 52'.5	07'.3	103° 50'.1	03'.3
18	344° 41'.9	48° 03'.4	42'.8	164° 56'.8	10'.2	233° 55'.2	07'.4	118° 52'.3	03'.4
19	359° 44'.3	63° 04'.5	42'.3	179° 58'.1	09'.7	248° 57'.9	07'.4	133° 54'.5	03'.5
20	14° 46'.8	78° 05'.6	41'.8	194° 59'.4	09'.2	264° 00'.6	07'.4	148° 56'.7	03'.5
21	29° 49'.3	93° 06'.6	41'.3	210° 00'.6	08'.7	279° 03'.3	07'.5	163° 58'.9	03'.6
22	44° 51'.7	108° 07'.7	40'.7	225° 01'.9	08'.2	294° 06'.0	07'.5	179° 01'.1	03'.7
23	59° 54'.2	123° 08'.8	40'.2	240° 03'.2	07'.8	309° 08'.7	07'.5	194° 03'.3	03'.8
	M.P. 19:05	v 1'.0	d 0'.5	v 1'.3	d 0'.5	v 2'.7	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.7	40° 15'.1 S
Achernar	335° 26'.2	57° 10'.2 S
Acrux	173° 09'.1	63° 10'.3 S
Adhara	255° 11'.9	28° 59'.5 S
Aldebaran	290° 48'.6	16° 32'.1 N
Alioth	166° 20'.8	55° 52'.8 N
Alkaid	152° 59'.1	49° 14'.5 N
Alnair	27° 43'.5	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.7 S
Alphard	217° 55'.6	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.2 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.2	8° 54'.6 N
Ankaa	353° 15'.3	42° 14'.0 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.3	69° 02'.9 S
Avior	234° 17'.4	59° 33'.2 S
Bellatrix	278° 31'.3	6° 21'.6 N
Betelgeuse	271° 00'.6	7° 24'.4 N
Canopus	263° 55'.5	52° 42'.2 S
Capella	280° 33'.5	46° 00'.5 N
Deneb	49° 31'.5	45° 20'.2 N
Denebola	182° 33'.4	14° 29'.5 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.5	61° 40'.2 N
Elnath	278° 11'.8	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.5 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.7	29° 32'.9 S
Gacrux	172° 00'.7	57° 11'.2 S
Gienah	175° 52'.1	17° 37'.1 S
Hadar	148° 47'.8	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.2	74° 05'.8 N
Markab	13° 38'.0	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.5	36° 26'.1 S
Miaplacidus	221° 39'.0	69° 46'.3 S
Mirfak	308° 39'.3	49° 54'.6 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.4 S
Polaris	317° 11'.3	89° 19'.5 N
Pollux	243° 27'.1	27° 59'.3 N
Procyon	244° 59'.1	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.2 N
Regulus	207° 43'.1	11° 53'.8 N
Rigel	281° 11'.4	8° 11'.3 S
Rigil Kent	139° 51'.7	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.8	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.1	16° 44'.2 S
Spica	158° 31'.1	11° 13'.9 S
Suhail	222° 52'.0	43° 29'.3 S
Vega	80° 39'.1	38° 48'.1 N
Zuben'ubi	137° 05'.4	16° 05'.8 S

	SHA	Mer.Pass.
Venus	64° 22'.7	14:50
Mars	181° 05'.7	07:03
Jupiter	249° 03'.6	02:31
Saturn	134° 22'.2	10:09

SUN				MOON					
GHA	Dec	GHA	v	Dec	d	HP
182° 34'.9	22° 05'.1 S	182° 23'.1	4'.1	19° 13'.5 S	2'.3	60'.6
197° 34'.6	05'.5	196° 46'.2	4'.0	15'.8	2'.1	
212° 34'.4	05'.8	211° 09'.2	4'.0	17'.9	2'.0	
227° 34'.1	06'.2	225° 32'.2	4'.0	19'.9	1'.9	60'.7
242° 33'.9	06'.5	239° 55'.2	3'.9	21'.8	1'.8	
257° 33'.6	06'.9	254° 18'.1	4'.0	23'.6	1'.5	
272° 33'.4	07'.2	268° 41'.1	3'.8	25'.1	1'.5	
287° 33'.1	07'.6	283° 03'.9	3'.9	26'.6	1'.3	
302° 32'.9	07'.9	297° 26'.8	3'.8	27'.9	1'.2	
317° 32'.6	08'.3	311° 49'.6	3'.8	29'.1	1'.0	
332° 32'.4	08'.6	326° 12'.4	3'.7	30'.1	0'.9	
347° 32'.1	09'.0	340° 35'.1	3'.8	31'.0	0'.7	60'.8
2° 31'.9	22° 09'.3 S	354° 57'.9	3'.7	19° 31'.7 S	0'.6	60'.8
17° 31'.6	09'.7	9° 20'.6	3'.7	32'.3	0'.4	
32° 31'.4	10'.0	23° 43'.3	3'.7	32'.7	0'.3	
47° 31'.1	10'.4	38° 06'.0	3'.7	33'.0	0'.2	
62° 30'.9	10'.7	52° 28'.7	3'.7	33'.2	0'.0	
77° 30'.6	11'.1	66° 51'.4	3'.6	33'.2	0'.1	
92° 30'.4	11'.4	81° 14'.0	3'.7	33'.1	0'.3	
107° 30'.1	11'.7	95° 36'.7	3'.6	32'.8	0'.4	
122° 29'.9	12'.1	109° 59'.3	3'.7	32'.4	0'.6	
137° 29'.6	12'.4	124° 22'.0	3'.6	31'.8	0'.7	60'.9
152° 29'.4	12'.8	138° 44'.6	3'.6	31'.1	0'.9	
167° 29'.1	13'.1	153° 07'.2	3'.7	30'.2	1'.0	
182° 28'.9	22° 13'.4 S	167° 29'.9	3'.6	19° 29'.2 S	1'.1	60'.9
197° 28'.6	13'.8	181° 52'.5	3'.7	28'.1	1'.3	
212° 28'.4	14'.1	196° 15'.2	3'.6	26'.8	1'.4	
227° 28'.1	14'.4	210° 37'.8	3'.7	25'.4	1'.6	
242° 27'.9	14'.8	225° 00'.5	3'.7	23'.8	1'.7	
257° 27'.6	15'.1	239° 23'.2	3'.7	22'.1	1'.9	
272° 27'.4	15'.4	253° 45'.9	3'.7	20'.2	2'.0	
287° 27'.1	15'.8	268° 08'.6	3'.7	18'.2	2'.2	
302° 26'.9	16'.1	282° 31'.3	3'.7	16'.0	2'.3	
317° 26'.6	16'.4	296° 54'.0	3'.8	13'.7	2'.4	
332° 26'.3	16'.8	311° 16'.8	3'.7	11'.3	2'.6	
347° 26'.1	17'.1	325° 39'.5	3'.9	08'.7	2'.7	
2° 25'.8	22° 17'.4 S	340° 02'.4	3'.8	19° 06'.0 S	2'.9	60'.9
17° 25'.6	17'.7	354° 25'.2	3'.8	03'.1	3'.0	
32° 25'.3	18'.1	8° 48'.0	3'.9	00'.1	3'.2	
47° 25'.1	18'.4	23° 10'.9	3'.9	18° 56'.9 S	3'.2	
62° 24'.8	18'.7	37° 33'.8	4'.0	53'.7	3'.5	
77° 24'.6	19'.0	51° 56'.8	4'.0	50'.2	3'.5	
92° 24'.3	19'.4	66° 19'.8	4'.0	46'.7	3'.7	
107° 24'.0	19'.7	80° 42'.8	4'.0	43'.0	3'.9	
122° 23'.8	20'.0	95° 05'.8	4'.1	39'.1	3'.9	
137° 23'.5	20'.3	109° 28'.9	4'.2	35'.2	4'.1	
152° 23'.3	20'.7	123° 52'.1	4'.1	31'.1	4'.3	
167° 23'.0	21'.0	138° 15'.2	4'.3	26'.8	4'.4	
182° 22'.8	22° 21'.3 S	152° 38'.5	4'.2	18° 22'.4 S	4'.5	60'.9
197° 22'.5	21'.6	167° 01'.7	4'.3	17'.9	4'.6	60'.8
212° 22'.2	21'.9	181° 25'.0	4'.4	13'.3	4'.8	
227° 22'.0	22'.3	195° 48'.4	4'.4	08'.5	4'.9	
242° 21'.7	22'.6	210° 11'.8	4'.4	03'.6	5'.0	
257° 21'.5	22'.9	224° 35'.2	4'.6	17° 58'.6 S	5'.1	
272° 21'.2	23'.2	238° 58'.8	4'.5	53'.5	5'.3	
287° 20'.9	23'.5	253° 22'.3	4'.6	48'.2	5'.4	
302° 20'.7	23'.8	267° 45'.9	4'.7	42'.8	5'.6	
317° 20'.4	24'.1	282° 09'.6	4'.7	37'.2	5'.6	
332° 20'.2	24'.5	296° 33'.3	4'.8	31'.6	5'.8	
347° 19'.9	24'.8	310° 57'.1	4'.9	25'.8	5'.9	60'.7
2° 19'.6	22° 25'.1 S	325° 21'.0	4'.9	17° 19'.9 S	6'.0	60'.7
17° 19'.4	25'.4	339° 44'.9	4'.9	13'.9	6'.1	
32° 19'.1	25'.7	354° 08'.8	5'.1	07'.8	6'.3	
47° 18'.9	26'.0	8° 32'.9	5'.1	01'.5	6'.4	
62° 18'.6	26'.3	22° 57'.0	5'.1	16° 55'.1 S	6'.5	
77° 18'.3	26'.6	37° 21'.1	5'.2	48'.6	6'.6	
92° 18'.1	26'.9	51° 45'.3	5'.3	42'.0	6'.7	
107° 17'.8	27'.2	66° 09'.6	5'.4	35'.3	6'.8	60'.6
122° 17'.5	27'.5	80° 34'.0	5'.4	28'.5	6'.9	
137° 17'.3	27'.8	94° 58'.4	5'.5	21'.6	7'.1	
152° 17'.0	28'.1	109° 22'.9	5'.5	14'.5	7'.1	
167° 16'.8	28'.4	123° 47'.4	5'.7	07'.4	7'.3	
SD 16'.2	d 0'.3	SD 16'.6		16'.6	16'.5	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 3	Moonrise 4	Moonrise 5
N 72°	07:59	10:04	-	-	-	13:19
N 70°	07:42	09:21	-	11:37	12:15	12:19
68°	07:28	08:52	10:56	10:25	11:19	11:44
66°	07:16	08:30	09:58	09:48	10:45	11:18
64°	07:07	08:13	09:24	09:22	10:20	10:59
62°	06:58	07:58	09:00	09:02	10:00	10:42
60°	06:50	07:46	08:41	08:45	09:44	10:29
N 58°	06:44	07:35	08:25	08:31	09:31	10:17
56°	06:38	07:26	08:12	08:19	09:19	10:07
54°	06:32	07:17	08:00	08:08	09:09	09:58
52°	06:27	07:10	07:50	07:59	09:00	09:50
50°	06:22	07:03	07:41	07:51	08:52	09:43
45°	06:11	06:48	07:21	07:33	08:34	09:27
N 40°	06:02	06:35	07:06	07:18	08:20	09:15
35°	05:53	06:24	06:52	07:06	08:08	09:04
30°	05:45	06:14	06:41	06:55	07:57	08:54
20°	05:29	05:57	06:21	06:37	07:39	08:38
N 10°	05:14	05:40	06:03	06:21	07:23	08:23
0°	04:58	05:24	05:47	06:06	07:09	08:10
S 10°	04:40	05:07	05:30	05:51	06:54	07:57
20°	04:19	04:48	05:12	05:36	06:38	07:42
30°	03:51	04:24	04:51	05:17	06:20	07:26
35°	03:34	04:10	04:39	05:07	06:09	07:16
40°	03:12	03:53	04:25	04:55	05:57	07:05
45°	02:44	03:31	04:08	04:41	05:43	06:52
S 50°	02:03	03:04	03:47	04:23	05:26	06:37
52°	01:40	02:50	03:37	04:15	05:18	06:29
54°	01:07	02:34	03:26	04:06	05:09	06:21
56°	-	02:14	03:13	03:56	04:58	06:12
58°	-	01:50	02:57	03:44	04:47	06:01
S 60°	-	01:14	02:39	03:31	04:33	05:49
S 62°	-	-	02:17	03:15	04:17	05:35

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 3	Moonset 4	Moonset 5
N 72°	-	13:35	15:41	-	-	15:42
N 70°	-	14:19	15:58	13:04	14:36	16:41
68°	12:44	14:48	16:12	14:16	15:33	17:15
66°	13:43	15:10	16:24	14:53	16:06	17:40
64°	14:16	15:28	16:34	15:19	16:31	17:59
62°	14:40	15:42	16:42	15:40	16:50	18:15
60°	14:59	15:54	16:50	15:56	17:06	18:28
N 58°	15:15	16:05	16:57	16:10	17:19	18:39
56°	15:28	16:14	17:03	16:22	17:31	18:49
54°	15:40	16:23	17:08	16:33	17:41	18:57
52°	15:50	16:30	17:13	16:42	17:50	19:05
50°	16:00	16:37	17:18	16:51	17:58	19:12
45°	16:19	16:52	17:29	17:09	18:15	19:26
N 40°	16:35	17:05	17:39	17:23	18:29	19:38
35°	16:48	17:16	17:47	17:36	18:40	19:49
30°	17:00	17:26	17:56	17:46	18:51	19:57
20°	17:20	17:44	18:11	18:05	19:08	20:13
N 10°	17:37	18:00	18:26	18:21	19:24	20:26
0°	17:54	18:16	18:42	18:36	19:38	20:39
S 10°	18:11	18:34	19:00	18:51	19:52	20:51
20°	18:29	18:53	19:22	19:07	20:07	21:04
30°	18:50	19:17	19:50	19:25	20:25	21:19
35°	19:02	19:31	20:07	19:36	20:35	21:28
40°	19:16	19:48	20:29	19:48	20:46	21:37
45°	19:33	20:10	20:58	20:02	21:00	21:49
S 50°	19:54	20:37	21:39	20:20	21:16	22:03
52°	20:04	20:51	22:03	20:28	21:24	22:09
54°	20:16	21:08	22:36	20:37	21:32	22:16
56°	20:29	21:27	-	20:47	21:42	22:24
58°	20:44	21:53	-	20:59	21:52	22:33
S 60°	21:02	22:29	-	21:13	22:05	22:43
S 62°	21:25	-	-	21:29	22:19	22:55

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
3	10 20	10 08	11:50	12:21	24:52	0d 0%
4	9 56	9 44	11:50	13:23	00:52	1d 3%
5	9 32	9 19	11:51	14:24	01:54	2d 9%

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2013 December 6, 7, 8 (Fri, Sat, Sun)

GMT	ARIES	VENUS -4.7		MARS +1.2		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
6 Friday 00	74° 56'.6	138° 09'.9	23° 39'.7 S	255° 04'.4	2° 07'.3 N	324° 11'.4	22° 07'.6 N	209° 05'.4	15° 03'.8 S
01	89° 59'.1	153° 11'.0	39'.2	270° 05'.7	06'.8	339° 14'.2	07'.6	224° 07'.6	03'.9
02	105° 01'.6	168° 12'.1	38'.7	285° 06'.9	06'.3	354° 16'.9	07'.7	239° 09'.8	04'.0
03	120° 04'.0	183° 13'.2	38'.2	300° 08'.2	05'.8	9° 19'.6	07'.7	254° 12'.0	04'.1
04	135° 06'.5	198° 14'.3	37'.7	315° 09'.5	05'.3	24° 22'.3	07'.7	269° 14'.2	04'.1
05	150° 09'.0	213° 15'.4	37'.1	330° 10'.7	04'.8	39° 25'.0	07'.8	284° 16'.4	04'.2
06	165° 11'.4	228° 16'.5	36'.6	345° 12'.0	04'.3	54° 27'.7	07'.8	299° 18'.6	04'.3
07	180° 13'.9	243° 17'.6	36'.1	0° 13'.3	03'.8	69° 30'.4	07'.8	314° 20'.7	04'.4
08	195° 16'.4	258° 18'.7	35'.6	15° 14'.5	03'.3	84° 33'.1	07'.9	329° 22'.9	04'.4
09	210° 18'.8	273° 19'.8	35'.1	30° 15'.8	02'.8	99° 35'.8	07'.9	344° 25'.1	04'.5
10	225° 21'.3	288° 20'.9	34'.6	45° 17'.1	02'.3	114° 38'.5	08'.0	359° 27'.3	04'.6
11	240° 23'.7	303° 22'.1	34'.0	60° 18'.3	01'.8	129° 41'.2	08'.0	14° 29'.5	04'.7
12	255° 26'.2	318° 23'.2	23° 33'.5 S	75° 19'.6	2° 01'.4 N	144° 43'.9	22° 08'.0 N	29° 31'.7	15° 04'.7 S
13	270° 28'.7	333° 24'.3	33'.0	90° 20'.9	00'.9	159° 46'.6	08'.1	44° 33'.9	04'.8
14	285° 31'.1	348° 25'.5	32'.5	105° 22'.1	00'.4	174° 49'.4	08'.1	59° 36'.0	04'.9
15	300° 33'.6	3° 26'.6	32'.0	120° 23'.4	1° 59'.9 N	189° 52'.1	08'.1	74° 38'.2	05'.0
16	315° 36'.1	18° 27'.7	31'.4	135° 24'.7	59'.4	204° 54'.8	08'.2	89° 40'.4	05'.0
17	330° 38'.5	33° 28'.9	30'.9	150° 25'.9	58'.9	219° 57'.5	08'.2	104° 42'.6	05'.1
18	345° 41'.0	48° 30'.0	30'.4	165° 27'.2	58'.4	235° 00'.2	08'.3	119° 44'.8	05'.2
19	0° 43'.5	63° 31'.2	29'.9	180° 28'.5	57'.9	250° 02'.9	08'.3	134° 47'.0	05'.3
20	15° 45'.9	78° 32'.3	29'.4	195° 29'.7	57'.4	265° 05'.6	08'.3	149° 49'.2	05'.3
21	30° 48'.4	93° 33'.5	28'.8	210° 31'.0	56'.9	280° 08'.3	08'.4	164° 51'.4	05'.4
22	45° 50'.9	108° 34'.6	28'.3	225° 32'.3	56'.4	295° 11'.0	08'.4	179° 53'.5	05'.5
23	60° 53'.3	123° 35'.8	27'.8	240° 33'.5	56'.0	310° 13'.8	08'.5	194° 55'.7	05'.6
7 Saturday 00	75° 55'.8	138° 36'.9	23° 27'.3 S	255° 34'.8	1° 55'.5 N	325° 16'.5	22° 08'.5 N	209° 57'.9	15° 05'.6 S
01	90° 58'.2	153° 38'.1	26'.8	270° 36'.1	55'.0	340° 19'.2	08'.5	225° 00'.1	05'.7
02	106° 00'.7	168° 39'.3	26'.2	285° 37'.3	54'.5	355° 21'.9	08'.6	240° 02'.3	05'.8
03	121° 03'.2	183° 40'.4	25'.7	300° 38'.6	54'.0	10° 24'.6	08'.6	255° 04'.5	05'.9
04	136° 05'.6	198° 41'.6	25'.2	315° 39'.9	53'.5	25° 27'.3	08'.7	270° 06'.7	05'.9
05	151° 08'.1	213° 42'.8	24'.7	330° 41'.1	53'.0	40° 30'.0	08'.7	285° 08'.8	06'.0
06	166° 10'.6	228° 44'.0	24'.1	345° 42'.4	52'.5	55° 32'.7	08'.7	300° 11'.0	06'.1
07	181° 13'.0	243° 45'.2	23'.6	0° 43'.7	52'.0	70° 35'.5	08'.8	315° 13'.2	06'.2
08	196° 15'.5	258° 46'.4	23'.1	15° 44'.9	51'.5	85° 38'.2	08'.8	330° 15'.4	06'.2
09	211° 18'.0	273° 47'.5	22'.6	30° 46'.2	51'.1	100° 40'.9	08'.8	345° 17'.6	06'.3
10	226° 20'.4	288° 48'.7	22'.0	45° 47'.5	50'.6	115° 43'.6	08'.9	0° 19'.8	06'.4
11	241° 22'.9	303° 49'.9	21'.5	60° 48'.8	50'.1	130° 46'.3	08'.9	15° 22'.0	06'.4
12	256° 25'.4	318° 51'.1	23° 21'.0 S	75° 50'.0	1° 49'.6 N	145° 49'.0	22° 09'.0 N	30° 24'.2	15° 06'.5 S
13	271° 27'.8	333° 52'.3	20'.5	90° 51'.3	49'.1	160° 51'.8	09'.0	45° 26'.3	06'.6
14	286° 30'.3	348° 53'.6	19'.9	105° 52'.6	48'.6	175° 54'.5	09'.0	60° 28'.5	06'.7
15	301° 32'.7	3° 54'.8	19'.4	120° 53'.8	48'.1	190° 57'.2	09'.1	75° 30'.7	06'.7
16	316° 35'.2	18° 56'.0	18'.9	135° 55'.1	47'.6	205° 59'.9	09'.1	90° 32'.9	06'.8
17	331° 37'.7	33° 57'.2	18'.4	150° 56'.4	47'.1	221° 02'.6	09'.2	105° 35'.1	06'.9
18	346° 40'.1	48° 58'.4	17'.8	165° 57'.7	46'.6	236° 05'.3	09'.2	120° 37'.3	07'.0
19	1° 42'.6	63° 59'.6	17'.3	180° 58'.9	46'.2	251° 08'.1	09'.2	135° 39'.5	07'.0
20	16° 45'.1	79° 00'.9	16'.8	196° 00'.2	45'.7	266° 10'.8	09'.3	150° 41'.7	07'.1
21	31° 47'.5	94° 02'.1	16'.3	211° 01'.5	45'.2	281° 13'.5	09'.3	165° 43'.8	07'.2
22	46° 50'.0	109° 03'.3	15'.7	226° 02'.8	44'.7	296° 16'.2	09'.4	180° 46'.0	07'.3
23	61° 52'.5	124° 04'.6	15'.2	241° 04'.0	44'.2	311° 18'.9	09'.4	195° 48'.2	07'.3
8 Sunday 00	76° 54'.9	139° 05'.8	23° 14'.7 S	256° 05'.3	1° 43'.7 N	326° 21'.6	22° 09'.4 N	210° 50'.4	15° 07'.4 S
01	91° 57'.4	154° 07'.1	14'.1	271° 06'.6	43'.2	341° 24'.4	09'.5	225° 52'.6	07'.5
02	106° 59'.9	169° 08'.3	13'.6	286° 07'.8	42'.7	356° 27'.1	09'.5	240° 54'.8	07'.6
03	122° 02'.3	184° 09'.6	13'.1	301° 09'.1	42'.3	11° 29'.8	09'.6	255° 57'.0	07'.6
04	137° 04'.8	199° 10'.8	12'.6	316° 10'.4	41'.8	26° 32'.5	09'.6	270° 59'.2	07'.7
05	152° 07'.2	214° 12'.1	12'.0	331° 11'.7	41'.3	41° 35'.3	09'.6	286° 01'.4	07'.8
06	167° 09'.7	229° 13'.3	11'.5	346° 12'.9	40'.8	56° 38'.0	09'.7	301° 03'.5	07'.8
07	182° 12'.2	244° 14'.6	11'.0	1° 14'.2	40'.3	71° 40'.7	09'.7	316° 05'.7	07'.9
08	197° 14'.6	259° 15'.9	10'.4	16° 15'.5	39'.8	86° 43'.4	09'.7	331° 07'.9	08'.0
09	212° 17'.1	274° 17'.1	09'.9	31° 16'.8	39'.3	101° 46'.1	09'.8	346° 10'.1	08'.1
10	227° 19'.6	289° 18'.4	09'.4	46° 18'.1	38'.8	116° 48'.9	09'.8	1° 12'.3	08'.1
11	242° 22'.0	304° 19'.7	08'.8	61° 19'.3	38'.4	131° 51'.6	09'.9	16° 14'.5	08'.2
12	257° 24'.5	319° 21'.0	23° 08'.3 S	76° 20'.6	1° 37'.9 N	146° 54'.3	22° 09'.9 N	31° 16'.7	15° 08'.3 S
13	272° 27'.0	334° 22'.2	07'.8	91° 21'.9	37'.4	161° 57'.0	09'.9	46° 18'.9	08'.4
14	287° 29'.4	349° 23'.5	07'.3	106° 23'.2	36'.9	176° 59'.8	10'.0	61° 21'.1	08'.4
15	302° 31'.9	4° 24'.8	06'.7	121° 24'.4	36'.4	192° 02'.5	10'.0	76° 23'.2	08'.5
16	317° 34'.3	19° 26'.1	06'.2	136° 25'.7	35'.9	207° 05'.2	10'.1	91° 25'.4	08'.6
17	332° 36'.8	34° 27'.4	05'.7	151° 27'.0	35'.4	222° 07'.9	10'.1	106° 27'.6	08'.7
18	347° 39'.3	49° 28'.7	05'.1	166° 28'.3	35'.0	237° 10'.6	10'.1	121° 29'.8	08'.7
19	2° 41'.7	64° 30'.0	04'.6	181° 29'.5	34'.5	252° 13'.4	10'.2	136° 32'.0	08'.8
20	17° 44'.2	79° 31'.3	04'.1	196° 30'.8	34'.0	267° 16'.1	10'.2	151° 34'.2	08'.9
21	32° 46'.7	94° 32'.6	03'.5	211° 32'.1	33'.5	282° 18'.8	10'.3	166° 36'.4	08'.9
22	47° 49'.1	109° 34'.0	03'.0	226° 33'.4	33'.0	297° 21'.5	10'.3	181° 38'.6	09'.0
23	62° 51'.6	124° 35'.3	02'.5	241° 34'.7	32'.5	312° 24'.3	10'.3	196° 40'.8	09'.1
	M.P. 18:53	v 1'.2	d 0'.5	v 1'.3	d 0'.5	v 2'.7	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.7	40° 15'.1 S
Achernar	335° 26'.2	57° 10'.2 S
Acrux	173° 09'.1	63° 10'.3 S
Adhara	255° 11'.9	28° 59'.5 S
Aldebaran	290° 48'.6	16° 32'.1 N
Alioth	166° 20'.8	55° 52'.8 N
Alkaid	152° 59'.0	49° 14'.5 N
Alnair	27° 43'.5	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.7 S
Alphard	217° 55'.6	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.1 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.2	8° 54'.6 N
Ankaa	353° 15'.3	42° 14'.0 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.3	69° 02'.9 S
Avior	234° 17'.4	59° 33'.2 S
Bellatrix	278° 31'.3	6° 21'.6 N
Betelgeuse	271° 00'.6	7° 24'.4 N
Canopus	263° 55'.5	52° 42'.3 S
Capella	280° 33'.5	46° 00'.5 N
Deneb	49° 31'.5	45° 20'.2 N
Denebola	182° 33'.4	14° 29'.5 N
Diphda	348° 55'.4	17° 54'.6 S
Dubhe	193° 51'.4	61° 40'.2 N
Elnath	278° 11'.8	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.5 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.7	29° 32'.9 S
Gacrux	172° 00'.7	57° 11'.2 S
Gienah	175° 52'.0	17° 37'.1 S
Hadar	148° 47'.8	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.2	74° 05'.8 N
Markab	13° 38'.0	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.4	36° 26'.1 S
Miaplacidus	221° 39'.0	69° 46'.3 S
Mirfak	308° 39'.3	49° 54'.7 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.4 S
Polaris	317° 11'.7	89° 19'.6 N
Pollux	243° 27'.0	27° 59'.3 N
Procyon	244° 59'.1	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.2 N
Regulus	207° 43'.1	11° 53'.8 N
Rigel	281° 11'.4	8° 11'.3 S
Rigil Kent	139° 51'.7	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.8	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.1	16° 44'.2 S
Spica	158° 31'.1	11° 13'.9 S
Suhail	222° 51'.9	43° 29'.3 S
Vega	80° 39'.1	38° 48'.1 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	62° 41'.2	14:44
Mars	179° 39'.0	06:57
Jupiter	249° 20'.7	02:18
Saturn	134° 02'.1	09:59

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
182° 16'.5	22° 28'.7 S	138° 12'.1	5'.7	16° 00'.1 S	7'.3	60'.6
197° 16'.2	29'.0	152° 36'.8	5'.7	15° 52'.8 S	7'.5	60'.5
212° 16'.0	29'.3	167° 01'.5	5'.9	45'.3	7'.6	
227° 15'.7	29'.6	181° 26'.4	5'.9	37'.7	7'.7	
242° 15'.4	29'.9	195° 51'.3	6'.0	30'.0	7'.7	
257° 15'.2	30'.2	210° 16'.3	6'.0	22'.3	7'.9	
272° 14'.9	30'.5	224° 41'.3	6'.2	14'.4	8'.0	60'.4
287° 14'.6	30'.8	239° 06'.5	6'.2	06'.4	8'.0	
302° 14'.4	31'.1	253° 31'.7	6'.2	14° 58'.4 S	8'.2	
317° 14'.1	31'.4	267° 56'.9	6'.4	50'.2	8'.2	
332° 13'.8	31'.7	282° 22'.3	6'.4	42'.0	8'.4	
347° 13'.6	32'.0	296° 47'.7	6'.5	33'.6	8'.4	60'.3
2° 13'.3	22° 32'.3 S	311° 13'.2	6'.6	14° 25'.2 S	8'.5	60'.3
17° 13'.0	32'.6	325° 38'.8	6'.7	16'.7	8'.6	
32° 12'.8	32'.9	340° 04'.5	6'.7	08'.1	8'.7	
47° 12'.5	33'.2	354° 30'.2	6'.8	13° 59'.4 S	8'.8	
62° 12'.2	33'.5	8° 56'.0	6'.9	50'.6	8'.9	60'.2
77° 12'.0	33'.7	23° 21'.9	7'.0	41'.7	8'.9	
92° 11'.7	34'.0	37° 47'.9	7'.0	32'.8	9'.0	
107° 11'.4	34'.3	52° 13'.9	7'.1	23'.8	9'.1	
122° 11'.2	34'.6	66° 40'.0	7'.2	14'.7	9'.2	60'.1
137° 10'.9	34'.9	81° 06'.2	7'.3	05'.5	9'.3	
152° 10'.6	35'.2	95° 32'.5	7'.3	12° 56'.2 S	9'.3	
167° 10'.4	35'.5	109° 58'.8	7'.5	46'.9	9'.4	
182° 10'.1	22° 35'.7 S	124° 25'.3	7'.5	12° 37'.5 S	9'.5	60'.0
197° 09'.8	36'.0	138° 51'.8	7'.6	28'.0	9'.5	
212° 09'.6	36'.3	153° 18'.4	7'.6	18'.5	9'.7	
227° 09'.3	36'.6	167° 45'.0	7'.7	08'.8	9'.6	
242° 09'.0	36'.9	182° 11'.7	7'.8	11° 59'.2 S	9'.8	59'.9
257° 08'.8	37'.1	196° 38'.5	7'.9	49'.4	9'.8	
272° 08'.5	37'.4	211° 05'.4	8'.0	39'.6	9'.9	
287° 08'.2	37'.7	225° 32'.4	8'.0	29'.7	9'.9	
302° 07'.9	38'.0	239° 59'.4	8'.1	19'.8	10'.0	59'.8
317° 07'.7	38'.2	254° 26'.5	8'.2	09'.8	10'.1	
332° 07'.4	38'.5	268° 53'.7	8'.3	10° 59'.7 S	10'.1	
347° 07'.1	38'.8	283° 21'.0	8'.3	49'.6	10'.2	
2° 06'.9	22° 39'.1 S	297° 48'.3	8'.4	10° 39'.4 S	10'.2	59'.7
17° 06'.6	39'.3	312° 15'.7	8'.5	29'.2	10'.3	
32° 06'.3	39'.6	326° 43'.2	8'.5	18'.9	10'.3	
47° 06'.0	39'.9	341° 10'.7	8'.7	08'.6	10'.4	59'.6
62° 05'.8	40'.2	355° 38'.4	8'.6	9° 58'.2 S	10'.4	
77° 05'.5	40'.4	10° 06'.0	8'.8	47'.8	10'.5	
92° 05'.2	40'.7	24° 33'.8	8'.9	37'.3	10'.5	
107° 05'.0	41'.0	39° 01'.7	8'.9	26'.8	10'.6	59'.5
122° 04'.7	41'.2	53° 29'.6	8'.9	16'.2	10'.6	
137° 04'.4	41'.5	67° 57'.5	9'.1	05'.6	10'.7	
152° 04'.1	41'.8	82° 25'.6	9'.1	8° 54'.9 S	10'.7	59'.4
167° 03'.9	42'.0	96° 53'.7	9'.2	44'.2	10'.7	
182° 03'.6	22° 42'.3 S	111° 21'.9	9'.3	8° 33'.5 S	10'.8	59'.4
197° 03'.3	42'.6	125° 50'.2	9'.3	22'.7	10'.8	
212° 03'.0	42'.8	140° 18'.5	9'.4	11'.9	10'.9	59'.3
227° 02'.8	43'.1	154° 46'.9	9'.4	01'.0	10'.9	
242° 02'.5	43'.3	169° 15'.3	9'.5	7° 50'.1 S	10'.9	
257° 02'.2	43'.6	183° 43'.8	9'.6	39'.2	10'.9	59'.2
272° 01'.9	43'.9	198° 12'.4	9'.7	28'.3	11'.0	
287° 01'.7	44'.1	212° 41'.1	9'.7	17'.3	11'.0	
302° 01'.4	44'.4	227° 09'.8	9'.8	06'.3	11'.1	59'.1
317° 01'.1	44'.6	241° 38'.6	9'.8	6° 55'.2 S	11'.1	
332° 00'.8	44'.9	256° 07'.4	9'.9	44'.1	11'.1	
347° 00'.6	45'.1	270° 36'.3	10'.0	33'.0	11'.1	
2° 00'.3	22° 45'.4 S	285° 05'.3	10'.0	6° 21'.9 S	11'.1	59'.0
17° 00'.0	45'.7	299° 34'.3	10'.1	10'.8	11'.2	
31° 59'.7	45'.9	314° 03'.4	10'.1	5° 59'.6 S	11'.2	
46° 59'.5	46'.2	328° 32'.5	10'.2	48'.4	11'.2	58'.9
61° 59'.2	46'.4	343° 01'.7	10'.2	37'.2	11'.2	
76° 58'.9	46'.7	357° 30'.9	10'.4	26'.0	11'.3	
91° 58'.6	46'.9	12° 00'.3	10'.3	14'.7	11'.3	58'.8
106° 58'.3	47'.2	26° 29'.6	10'.4	03'.4	11'.2	
121° 58'.1	47'.4	40° 59'.0	10'.5	4° 52'.2 S	11'.3	
136° 57'.8	47'.7	55° 28'.5	10'.5	40'.9	11'.3	
151° 57'.5	47'.9	69° 58'.0	10'.6	29'.6	11'.4	58'.7
166° 57'.2	48'.2	84° 27'.6	10'.7	18'.2	11'.3	
SD 16'.2	d 0'.3	SD	16'.4	16'.3	16'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 6	Moonrise 7	Moonrise 8
N 72°	08:06	10:18	-	12:47	12:33	12:22
N 70°	07:48	09:30	-	12:18	12:15	12:13
68°	07:33	08:59	11:20	11:56	12:02	12:05
66°	07:21	08:36	10:07	11:38	11:50	11:59
64°	07:11	08:18	09:32	11:24	11:41	11:54
62°	07:02	08:03	09:06	11:12	11:33	11:49
60°	06:54	07:50	08:46	11:01	11:26	11:45
N 58°	06:47	07:39	08:30	10:52	11:19	11:42
56°	06:41	07:30	08:16	10:44	11:14	11:38
54°	06:35	07:21	08:04	10:37	11:09	11:36
52°	06:30	07:13	07:54	10:31	11:04	11:33
50°	06:25	07:06	07:44	10:25	11:00	11:31
45°	06:14	06:51	07:24	10:13	10:51	11:25
N 40°	06:04	06:38	07:08	10:02	10:44	11:21
35°	05:55	06:27	06:55	09:53	10:38	11:17
30°	05:47	06:17	06:43	09:46	10:32	11:14
20°	05:31	05:59	06:22	09:32	10:22	11:08
N 10°	05:16	05:42	06:05	09:20	10:13	11:03
0°	04:59	05:25	05:48	09:09	10:05	10:58
S 10°	04:41	05:08	05:31	08:58	09:57	10:53
20°	04:19	04:48	05:13	08:46	09:48	10:48
30°	03:51	04:24	04:51	08:33	09:38	10:42
35°	03:33	04:10	04:39	08:25	09:33	10:39
40°	03:11	03:52	04:25	08:16	09:26	10:35
45°	02:42	03:31	04:07	08:05	09:19	10:31
S 50°	02:00	03:02	03:46	07:52	09:09	10:25
52°	01:35	02:48	03:36	07:46	09:05	10:23
54°	01:00	02:31	03:24	07:40	09:00	10:20
56°	-	02:11	03:11	07:32	08:55	10:17
58°	-	01:45	02:55	07:24	08:49	10:14
S 60°	-	01:06	02:36	07:14	08:43	10:10
S 62°	-	-	02:12	07:03	08:35	10:06

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 6	Moonset 7	Moonset 8
N 72°	-	13:25	15:36	18:15	20:25	22:24
N 70°	-	14:13	15:55	18:44	20:40	22:31
68°	12:23	14:44	16:09	19:05	20:52	22:36
66°	13:36	15:07	16:21	19:21	21:02	22:41
64°	14:11	15:25	16:32	19:35	21:11	22:44
62°	14:37	15:40	16:40	19:46	21:18	22:48
60°	14:57	15:52	16:48	19:55	21:24	22:50
N 58°	15:13	16:03	16:55	20:04	21:29	22:53
56°	15:27	16:13	17:02	20:11	21:34	22:55
54°	15:39	16:22	17:07	20:17	21:38	22:57
52°	15:49	16:30	17:13	20:23	21:42	22:59
50°	15:59	16:37	17:18	20:29	21:45	23:01
45°	16:18	16:52	17:29	20:40	21:53	23:04
N 40°	16:35	17:05	17:39	20:49	21:59	23:07
35°	16:48	17:16	17:48	20:57	22:05	23:10
30°	17:00	17:26	17:56	21:04	22:09	23:12
20°	17:21	17:44	18:12	21:16	22:17	23:16
N 10°	17:38	18:01	18:27	21:27	22:24	23:19
0°	17:55	18:18	18:44	21:36	22:31	23:22
S 10°	18:12	18:35	19:02	21:46	22:37	23:25
20°	18:31	18:55	19:24	21:56	22:44	23:29
30°	18:52	19:19	19:52	22:08	22:52	23:32
35°	19:04	19:34	20:10	22:14	22:56	23:34
40°	19:19	19:51	20:32	22:22	23:01	23:37
45°	19:36	20:13	21:02	22:31	23:07	23:39
S 50°	19:58	20:41	21:44	22:41	23:14	23:43
52°	20:08	20:56	22:09	22:46	23:17	23:44
54°	20:20	21:13	22:46	22:51	23:21	23:46
56°	20:33	21:33	-	22:57	23:24	23:47
58°	20:49	22:00	-	23:04	23:29	23:49
S 60°	21:08	22:40	-	23:11	23:33	23:52
S 62°	21:32	-	-	23:20	23:39	23:54

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
6	9 06	8 54	11:51	15:23	02:54	3d 17%
7	8 41	8 28	11:52	16:18	03:51	4d 27%
8	8 15	8 02	11:52	17:10	04:45	5d 38%

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2013 December 9, 10, 11 (Mon, Tue, Wed)

GMT	ARIES	VENUS -4.7		MARS +1.1		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
9 Monday 00	77° 54'.1	139° 36'.6	23° 01'.9 S	256° 35'.9	1° 32'.0 N	327° 27'.0	22° 10'.4 N	211° 42'.9	15° 09'.2 S
01	92° 56'.5	154° 37'.9	01'.4	271° 37'.2	31'.5	342° 29'.7	10'.4	226° 45'.1	09'.2
02	107° 59'.0	169° 39'.2	00'.9	286° 38'.5	31'.1	357° 32'.5	10'.5	241° 47'.3	09'.3
03	123° 01'.5	184° 40'.6	00'.3	301° 39'.8	30'.6	12° 35'.2	10'.5	256° 49'.5	09'.4
04	138° 03'.9	199° 41'.9	22° 59'.8 S	316° 41'.1	30'.1	27° 37'.9	10'.5	271° 51'.7	09'.5
05	153° 06'.4	214° 43'.3	59'.3	331° 42'.3	29'.6	42° 40'.6	10'.6	286° 53'.9	09'.5
06	168° 08'.8	229° 44'.6	58'.7	346° 43'.6	29'.1	57° 43'.4	10'.6	301° 56'.1	09'.6
07	183° 11'.3	244° 45'.9	58'.2	1° 44'.9	28'.6	72° 46'.1	10'.7	316° 58'.3	09'.7
08	198° 13'.8	259° 47'.3	57'.6	16° 46'.2	28'.2	87° 48'.8	10'.7	332° 00'.5	09'.7
09	213° 16'.2	274° 48'.6	57'.1	31° 47'.5	27'.7	102° 51'.5	10'.8	347° 02'.7	09'.8
10	228° 18'.7	289° 50'.0	56'.6	46° 48'.7	27'.2	117° 54'.3	10'.8	2° 04'.8	09'.9
11	243° 21'.2	304° 51'.4	56'.0	61° 50'.0	26'.7	132° 57'.0	10'.8	17° 07'.0	10'.0
12	258° 23'.6	319° 52'.7	22° 55'.5 S	76° 51'.3	1° 26'.2 N	147° 59'.7	22° 10'.9 N	32° 09'.2	15° 10'.0 S
13	273° 26'.1	334° 54'.1	55'.0	91° 52'.6	25'.7	163° 02'.5	10'.9	47° 11'.4	10'.1
14	288° 28'.6	349° 55'.5	54'.4	106° 53'.9	25'.2	178° 05'.2	11'.0	62° 13'.6	10'.2
15	303° 31'.0	4° 56'.8	53'.9	121° 55'.2	24'.8	193° 07'.9	11'.0	77° 15'.8	10'.3
16	318° 33'.5	19° 58'.2	53'.4	136° 56'.4	24'.3	208° 10'.7	11'.0	92° 18'.0	10'.3
17	333° 36'.0	34° 59'.6	52'.8	151° 57'.7	23'.8	223° 13'.4	11'.1	107° 20'.2	10'.4
18	348° 38'.4	50° 01'.0	52'.3	166° 59'.0	23'.3	238° 16'.1	11'.1	122° 22'.4	10'.5
19	3° 40'.9	65° 02'.4	51'.7	182° 00'.3	22'.8	253° 18'.8	11'.2	137° 24'.6	10'.5
20	18° 43'.3	80° 03'.7	51'.2	197° 01'.6	22'.3	268° 21'.6	11'.2	152° 26'.8	10'.6
21	33° 45'.8	95° 05'.1	50'.7	212° 02'.9	21'.9	283° 24'.3	11'.2	167° 28'.9	10'.7
22	48° 48'.3	110° 06'.5	50'.1	227° 04'.1	21'.4	298° 27'.0	11'.3	182° 31'.1	10'.8
23	63° 50'.7	125° 07'.9	49'.6	242° 05'.4	20'.9	313° 29'.8	11'.3	197° 33'.3	10'.8
10 Tuesday 00	78° 53'.2	140° 09'.3	22° 49'.1 S	257° 06'.7	1° 20'.4 N	328° 32'.5	22° 11'.4 N	212° 35'.5	15° 10'.9 S
01	93° 55'.7	155° 10'.8	48'.5	272° 08'.0	19'.9	343° 35'.2	11'.4	227° 37'.7	11'.0
02	108° 58'.1	170° 12'.2	48'.0	287° 09'.3	19'.4	358° 38'.0	11'.4	242° 39'.9	11'.0
03	124° 00'.6	185° 13'.6	47'.4	302° 10'.6	19'.0	13° 40'.7	11'.5	257° 42'.1	11'.1
04	139° 03'.1	200° 15'.0	46'.9	317° 11'.9	18'.5	28° 43'.4	11'.5	272° 44'.3	11'.2
05	154° 05'.5	215° 16'.4	46'.4	332° 13'.1	18'.0	43° 46'.2	11'.6	287° 46'.5	11'.3
06	169° 08'.0	230° 17'.8	45'.8	347° 14'.4	17'.5	58° 48'.9	11'.6	302° 48'.7	11'.3
07	184° 10'.4	245° 19'.3	45'.3	2° 15'.7	17'.0	73° 51'.6	11'.6	317° 50'.9	11'.4
08	199° 12'.9	260° 20'.7	44'.7	17° 17'.0	16'.6	88° 54'.4	11'.7	332° 53'.0	11'.5
09	214° 15'.4	275° 22'.1	44'.2	32° 18'.3	16'.1	103° 57'.1	11'.7	347° 55'.2	11'.6
10	229° 17'.8	290° 23'.6	43'.7	47° 19'.6	15'.6	118° 59'.8	11'.8	2° 57'.4	11'.6
11	244° 20'.3	305° 25'.0	43'.1	62° 20'.9	15'.1	134° 02'.6	11'.8	17° 59'.6	11'.7
12	259° 22'.8	320° 26'.5	22° 42'.6 S	77° 22'.1	1° 14'.6 N	149° 05'.3	22° 11'.9 N	33° 01'.8	15° 11'.8 S
13	274° 25'.2	335° 27'.9	42'.0	92° 23'.4	14'.1	164° 08'.1	11'.9	48° 04'.0	11'.8
14	289° 27'.7	350° 29'.4	41'.5	107° 24'.7	13'.7	179° 10'.8	11'.9	63° 06'.2	11'.9
15	304° 30'.2	5° 30'.8	41'.0	122° 26'.0	13'.2	194° 13'.5	12'.0	78° 08'.4	12'.0
16	319° 32'.6	20° 32'.3	40'.4	137° 27'.3	12'.7	209° 16'.3	12'.0	93° 10'.6	12'.1
17	334° 35'.1	35° 33'.8	39'.9	152° 28'.6	12'.2	224° 19'.0	12'.1	108° 12'.8	12'.1
18	349° 37'.6	50° 35'.2	39'.3	167° 29'.9	11'.7	239° 21'.7	12'.1	123° 15'.0	12'.2
19	4° 40'.0	65° 36'.7	38'.8	182° 31'.2	11'.3	254° 24'.5	12'.1	138° 17'.2	12'.3
20	19° 42'.5	80° 38'.2	38'.2	197° 32'.5	10'.8	269° 27'.2	12'.2	153° 19'.3	12'.3
21	34° 44'.9	95° 39'.7	37'.7	212° 33'.7	10'.3	284° 30'.0	12'.2	168° 21'.5	12'.4
22	49° 47'.4	110° 41'.1	37'.2	227° 35'.0	09'.8	299° 32'.7	12'.3	183° 23'.7	12'.5
23	64° 49'.9	125° 42'.6	36'.6	242° 36'.3	09'.3	314° 35'.4	12'.3	198° 25'.9	12'.6
11 Wednesday 00	79° 52'.3	140° 44'.1	22° 36'.1 S	257° 37'.6	1° 08'.9 N	329° 38'.2	22° 12'.3 N	213° 28'.1	15° 12'.6 S
01	94° 54'.8	155° 45'.6	35'.5	272° 38'.9	08'.4	344° 40'.9	12'.4	228° 30'.3	12'.7
02	109° 57'.3	170° 47'.1	35'.0	287° 40'.2	07'.9	359° 43'.6	12'.4	243° 32'.5	12'.8
03	124° 59'.7	185° 48'.6	34'.5	302° 41'.5	07'.4	14° 46'.4	12'.5	258° 34'.7	12'.8
04	140° 02'.2	200° 50'.1	33'.9	317° 42'.8	06'.9	29° 49'.1	12'.5	273° 36'.9	12'.9
05	155° 04'.7	215° 51'.6	33'.4	332° 44'.1	06'.5	44° 51'.9	12'.6	288° 39'.1	13'.0
06	170° 07'.1	230° 53'.1	32'.8	347° 45'.4	06'.0	59° 54'.6	12'.6	303° 41'.3	13'.1
07	185° 09'.6	245° 54'.7	32'.3	2° 46'.7	05'.5	74° 57'.4	12'.6	318° 43'.5	13'.1
08	200° 12'.0	260° 56'.2	31'.7	17° 47'.9	05'.0	90° 00'.1	12'.7	333° 45'.7	13'.2
09	215° 14'.5	275° 57'.7	31'.2	32° 49'.2	04'.5	105° 02'.8	12'.7	348° 47'.9	13'.3
10	230° 17'.0	290° 59'.2	30'.6	47° 50'.5	04'.1	120° 05'.6	12'.8	3° 50'.0	13'.3
11	245° 19'.4	306° 00'.8	30'.1	62° 51'.8	03'.6	135° 08'.3	12'.8	18° 52'.2	13'.4
12	260° 21'.9	321° 02'.3	22° 29'.6 S	77° 53'.1	1° 03'.1 N	150° 11'.1	22° 12'.8 N	33° 54'.4	15° 13'.5 S
13	275° 24'.4	336° 03'.8	29'.0	92° 54'.4	02'.6	165° 13'.8	12'.9	48° 56'.6	13'.6
14	290° 26'.8	351° 05'.4	28'.5	107° 55'.7	02'.1	180° 16'.5	12'.9	63° 58'.8	13'.6
15	305° 29'.3	6° 06'.9	27'.9	122° 57'.0	01'.7	195° 19'.3	13'.0	79° 01'.0	13'.7
16	320° 31'.8	21° 08'.5	27'.4	137° 58'.3	01'.2	210° 22'.0	13'.0	94° 03'.2	13'.8
17	335° 34'.2	36° 10'.0	26'.8	152° 59'.6	00'.7	225° 24'.8	13'.1	109° 05'.4	13'.8
18	350° 36'.7	51° 11'.6	26'.3	168° 00'.9	00'.2	240° 27'.5	13'.1	124° 07'.6	13'.9
19	5° 39'.2	66° 13'.1	25'.7	183° 02'.2	0° 59'.7 N	255° 30'.3	13'.1	139° 09'.8	14'.0
20	20° 41'.6	81° 14'.7	25'.2	198° 03'.5	59'.3	270° 33'.0	13'.2	154° 12'.0	14'.0
21	35° 44'.1	96° 16'.3	24'.7	213° 04'.8	58'.8	285° 35'.7	13'.2	169° 14'.2	14'.1
22	50° 46'.5	111° 17'.8	24'.1	228° 06'.1	58'.3	300° 38'.5	13'.3	184° 16'.4	14'.2
23	65° 49'.0	126° 19'.4	23'.6	243° 07'.4	57'.8	315° 41'.2	13'.3	199° 18'.6	14'.3
	M.P. 18:41	v 1'.5	d 0'.5	v 1'.3	d 0'.5	v 2'.7	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.8	40° 15'.1 S
Achernar	335° 26'.2	57° 10'.2 S
Acrux	173° 09'.0	63° 10'.3 S
Adhara	255° 11'.9	28° 59'.6 S
Aldebaran	290° 48'.6	16° 32'.1 N
Alioth	166° 20'.7	55° 52'.8 N
Alkaid	152° 59'.0	49° 14'.5 N
Alnair	27° 43'.5	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.7 S
Alphard	217° 55'.6	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.1 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.2	8° 54'.6 N
Ankaa	353° 15'.3	42° 14'.0 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.3	69° 02'.9 S
Avior	234° 17'.3	59° 33'.2 S
Bellatrix	278° 31'.3	6° 21'.6 N
Betelgeuse	271° 00'.6	7° 24'.4 N
Canopus	263° 55'.4	52° 42'.3 S
Capella	280° 33'.4	46° 00'.5 N
Deneb	49° 31'.5	45° 20'.2 N
Denebola	182° 33'.4	14° 29'.5 N
Diphda	348° 55'.4	17° 54'.7 S
Dubhe	193° 51'.4	61° 40'.1 N
Elnath	278° 11'.8	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.5 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.7	29° 32'.9 S
Gacrux	172° 00'.6	57° 11'.2 S
Gienah	175° 52'.0	17° 37'.1 S
Hadar	148° 47'.8	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.2	74° 05'.8 N
Markab	13° 38'.0	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.4	36° 26'.1 S
Miaplacidus	221° 39'.0	69° 46'.3 S
Mirfak	308° 39'.3	49° 54'.7 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.4 S
Polaris	317° 12'.4	89° 19'.6 N
Pollux	243° 27'.0	27° 59'.3 N
Procyon	244° 59'.1	5° 11'.2 N
Rasalhague	96° 06'.5	12° 33'.2 N
Regulus	207° 43'.1	11° 53'.8 N
Rigel	281° 11'.4	8° 11'.3 S
Rigil Kent	139° 51'.7	60° 53'.3 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.8	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.1	16° 44'.3 S
Spica	158° 31'.1	11° 14'.0 S
Suhail	222° 51'.9	43° 29'.3 S
Vega	80° 39'.1	38° 48'.1 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	61° 16'.1	14:38
Mars	178° 13'.5	06:51
Jupiter	249° 39'.3	02:05
Saturn	133° 42'.3	09:48

GMT	SUN GHA	SUN Dec	MOON GHA	MOON v	MOON Dec	MOON d	MOON HP
9 Monday 00	181° 57'.0	22° 48'.4 S	98° 57'.3	10'.6	4° 06'.9 S	11'.3	58'.7
01	196° 56'.7	48'.6	113° 26'.9	10'.8	3° 55'.6 S	11'.4	58'.6
02	211° 56'.4	48'.9	127° 56'.7	10'.8	44'.2	11'.4	
03	226° 56'.1	49'.1	142° 26'.5	10'.8	32'.8	11'.3	
04	241° 55'.8	49'.4	156° 56'.3	10'.9	21'.5	11'.4	58'.5
05	256° 55'.6	49'.6	171° 26'.2	10'.9	10'.1	11'.4	
06	271° 55'.3	49'.9	185° 56'.1	11'.0	2° 58'.7 S	11'.4	
07	286° 55'.0	50'.1	200° 26'.1	11'.0	47'.3	11'.4	58'.4
08	301° 54'.7	50'.3	214° 56'.1	11'.0	35'.9	11'.3	
09	316° 54'.4	50'.6	229° 26'.1	11'.1	24'.6	11'.4	
10	331° 54'.2	50'.8	243° 56'.2	11'.2	13'.2	11'.4	58'.3
11	346° 53'.9	51'.1	258° 26'.4	11'.2	01'.8	11'.4	
12	1° 53'.6	22° 51'.3 S	272° 56'.6	11'.2	1° 50'.4 S	11'.4	58'.3
13	16° 53'.3	51'.5	287° 26'.8	11'.3	39'.0	11'.4	
14	31° 53'.0	51'.8	301° 57'.1	11'.3	27'.6	11'.3	58'.2
15	46° 52'.8	52'.0	316° 27'.4	11'.4	16'.3	11'.4	
16	61° 52'.5	52'.2	330° 57'.8	11'.4	04'.9	11'.4	
17	76° 52'.2	52'.5	345° 28'.2	11'.4	0° 53'.5 S	11'.3	58'.1
18	91° 51'.9	52'.7	359° 58'.6	11'.4	42'.2	11'.4	
19	106° 51'.6	52'.9	14° 29'.0	11'.5	30'.8	11'.3	
20	121° 51'.4	53'.2	28° 59'.5	11'.6	19'.5	11'.3	58'.0
21	136° 51'.1	53'.4	43° 30'.1	11'.5	08'.2	11'.4	
22	151° 50'.8	53'.6	58° 00'.6	11'.6	0° 03'.2 N	11'.3	
23	166° 50'.5	53'.8	72° 31'.2	11'.7	14'.5	11'.2	57'.9
10 Tuesday 00	181° 50'.2	22° 54'.1 S	87° 01'.9	11'.6	0° 25'.7 N	11'.3	57'.9
01	196° 49'.9	54'.3	101° 32'.5	11'.7	37'.0	11'.3	
02	211° 49'.7	54'.5	116° 03'.2	11'.8	48'.3	11'.2	
03	226° 49'.4	54'.7	130° 34'.0	11'.7	59'.5	11'.3	57'.8
04	241° 49'.1	55'.0	145° 04'.7	11'.8	1° 10'.8 N	11'.2	
05	256° 48'.8	55'.2	159° 35'.5	11'.8	22'.0	11'.2	
06	271° 48'.5	55'.4	174° 06'.3	11'.9	33'.2	11'.1	57'.7
07	286° 48'.2	55'.6	188° 37'.2	11'.8	44'.3	11'.2	
08	301° 48'.0	55'.9	203° 08'.0	11'.9	55'.5	11'.1	
09	316° 47'.7	56'.1	217° 38'.9	11'.9	2° 06'.6 N	11'.1	57'.6
10	331° 47'.4	56'.3	232° 09'.8	12'.0	17'.7	11'.1	
11	346° 47'.1	56'.5	246° 40'.8	11'.9	28'.8	11'.1	
12	1° 46'.8	22° 56'.7 S	261° 11'.7	12'.0	2° 39'.9 N	11'.0	57'.6
13	16° 46'.5	56'.9	275° 42'.7	12'.0	50'.9	11'.1	57'.5
14	31° 46'.3	57'.2	290° 13'.7	12'.0	3° 02'.0 N	11'.0	
15	46° 46'.0	57'.4	304° 44'.7	12'.1	13'.0	10'.9	
16	61° 45'.7	57'.6	319° 15'.8	12'.0	23'.9	11'.0	57'.4
17	76° 45'.4	57'.8	333° 46'.8	12'.1	34'.9	10'.9	
18	91° 45'.1	58'.0	348° 17'.9	12'.1	45'.8	10'.8	
19	106° 44'.8	58'.2	2° 49'.0	12'.1	56'.6	10'.9	57'.3
20	121° 44'.5	58'.4	17° 20'.1	12'.2	4° 07'.5 N	10'.8	
21	136° 44'.3	58'.6	31° 51'.3	12'.1	18'.3	10'.8	
22	151° 44'.0	58'.9	46° 22'.4	12'.2	29'.1	10'.7	
23	166° 43'.7	59'.1	60° 53'.6	12'.1	39'.8	10'.8	57'.2
11 Wednesday 00	181° 43'.4	22° 59'.3 S	75° 24'.7	12'.2	4° 50'.6 N	10'.6	57'.2
01	196° 43'.1	59'.5	89° 55'.9	12'.2	5° 01'.2 N	10'.7	
02	211° 42'.8	59'.7	104° 27'.1	12'.2	11'.9	10'.6	57'.1
03	226° 42'.5	59'.9	118° 58'.3	12'.3	22'.5	10'.6	
04	241° 42'.3	23° 00'.1 S	133° 29'.6	12'.2	33'.1	10'.5	
05	256° 42'.0	00'.3	148° 00'.8	12'.2	43'.6	10'.5	
06	271° 41'.7	00'.5	162° 32'.0	12'.3	54'.1	10'.5	57'.0
07	286° 41'.4	00'.7	177° 03'.3	12'.3	6° 04'.6 N	10'.4	
08	301° 41'.1	00'.9	191° 34'.6	12'.2	15'.0	10'.4	
09	316° 40'.8	01'.1	206° 05'.8	12'.3	25'.4	10'.4	
10	331° 40'.5	01'.3	220° 37'.1	12'.3	35'.8	10'.3	56'.9
11	346° 40'.2	01'.5	235° 08'.4	12'.3	46'.1	10'.2	
12	1° 39'.9	23° 01'.7 S	249° 39'.7	12'.3	6° 56'.3 N	10'.2	56'.9
13	16° 39'.7	01'.9	264° 11'.0	12'.3	7° 06'.5 N	10'.2	56'.8
14	31° 39'.4	02'.1	278° 42'.3	12'.3	16'.7	10'.2	
15	46° 39'.1	02'.3	293° 13'.6	12'.3	26'.9	10'.0	
16	61° 38'.8	02'.5	307° 44'.9	12'.3	36'.9	10'.1	
17	76° 38'.5	02'.7	322° 16'.2	12'.3	47'.0	10'.0	56'.7
18	91° 38'.2	02'.9	336° 47'.5	12'.3	57'.0	9'.9	
19	106° 37'.9	03'.1	351° 18'.8	12'.3	8° 06'.9 N	9'.9	
20	121° 37'.6	03'.3	5° 50'.1	12'.3	16'.8	9'.9	
21	136° 37'.3	03'.5	20° 21'.4	12'.4	26'.7	9'.8	56'.6
22	151° 37'.1	03'.7	34° 52'.8	12'.3	36'.5	9'.7	
23	166° 36'.8	03'.8	49° 24'.1	12'.3	46'.2	9'.7	
	SD 16'.2	d 0'.2	SD	15'.9	15'.7	15'.5	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 9	Moonrise 10	Moonrise 11
N 72°	08:12	10:30	-	12:13	12:04	11:55
N 70°	07:53	09:38	-	12:10	12:07	12:05
68°	07:38	09:05	-	12:08	12:10	12:13
66°	07:26	08:41	10:16	12:06	12:13	12:19
64°	07:15	08:23	09:38	12:05	12:15	12:25
62°	07:06	08:07	09:11	12:03	12:16	12:30
60°	06:58	07:54	08:51	12:02	12:18	12:34
N 58°	06:51	07:43	08:34	12:01	12:19	12:38
56°	06:44	07:33	08:20	12:00	12:21	12:41
54°	06:38	07:24	08:08	11:59	12:22	12:44
52°	06:33	07:16	07:57	11:59	12:23	12:47
50°	06:28	07:09	07:47	11:58	12:24	12:50
45°	06:17	06:54	07:27	11:56	12:26	12:55
N 40°	06:07	06:40	07:11	11:55	12:28	13:00
35°	05:57	06:29	06:57	11:54	12:29	13:04
30°	05:49	06:19	06:45	11:53	12:30	13:08
20°	05:33	06:00	06:24	11:51	12:33	13:14
N 10°	05:17	05:43	06:06	11:50	12:35	13:19
0°	05:01	05:27	05:49	11:48	12:37	13:25
S 10°	04:42	05:09	05:32	11:47	12:39	13:30
20°	04:20	04:49	05:13	11:46	12:41	13:35
30°	03:51	04:25	04:52	11:44	12:44	13:42
35°	03:33	04:10	04:39	11:43	12:45	13:46
40°	03:11	03:52	04:25	11:42	12:47	13:50
45°	02:41	03:30	04:07	11:41	12:49	13:55
S 50°	01:58	03:01	03:45	11:39	12:51	14:01
52°	01:32	02:47	03:35	11:39	12:52	14:04
54°	00:53	02:30	03:23	11:38	12:53	14:07
56°	-	02:09	03:09	11:37	12:55	14:10
58°	-	01:41	02:53	11:36	12:56	14:14
S 60°	-	00:59	02:34	11:35	12:58	14:18
S 62°	-	-	02:09	11:34	13:00	14:23

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 9	Moonset 10	Moonset 11
N 72°	-	13:15	15:33	-	00:17	02:06
N 70°	-	14:08	15:52	-	00:16	01:58
68°	-	14:40	16:07	-	00:16	01:52
66°	13:30	15:04	16:20	-	00:15	01:47
64°	14:08	15:23	16:30	-	00:15	01:43
62°	14:34	15:38	16:39	-	00:15	01:39
60°	14:55	15:51	16:47	-	00:15	01:36
N 58°	15:11	16:02	16:55	-	00:14	01:33
56°	15:26	16:12	17:01	-	00:14	01:31
54°	15:38	16:21	17:07	-	00:14	01:29
52°	15:49	16:29	17:13	-	00:14	01:27
50°	15:58	16:36	17:18	-	00:14	01:25
45°	16:18	16:52	17:29	-	00:13	01:21
N 40°	16:35	17:05	17:39	-	00:13	01:17
35°	16:49	17:17	17:48	-	00:13	01:14
30°	17:01	17:27	17:57	-	00:13	01:12
20°	17:21	17:45	18:13	-	00:12	01:07
N 10°	17:40	18:02	18:29	-	00:12	01:03
0°	17:57	18:19	18:45	-	00:12	01:00
S 10°	18:14	18:37	19:04	-	00:11	00:56
20°	18:32	18:57	19:26	-	00:11	00:52
30°	18:54	19:21	19:54	-	00:11	00:48
35°	19:07	19:36	20:13	-	00:10	00:45
40°	19:21	19:54	20:35	-	00:10	00:42
45°	19:39	20:16	21:05	-	00:10	00:39
S 50°	20:01	20:45	21:49	-	00:09	00:35
52°	20:12	21:00	22:15	-	00:09	00:33
54°	20:24	21:17	22:55	-	00:09	00:31
56°	20:37	21:38	-	-	00:08	00:29
58°	20:53	22:06	-	-	00:08	00:27
S 60°	21:13	22:49	-	-	00:08	00:24
S 62°	21:38	-	-	-	00:08	00:21

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
9	7 48	7 35	11:52	18:00	05:35	6d 49%
10	7 21	7 08	11:53	18:48	06:24	7d 59%
11	6 54	6 40	11:53	19:36	07:12	8d 70%

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2013 December 12, 13, 14 (Thur, Fri, Sat)

GMT	ARIES	VENUS -4.7		MARS +1.1		JUPITER -2.6		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
12 Thursday 00	80° 51'.5	141° 21'.0	22° 23'.0 S	258° 08'.7	0° 57'.4 N	330° 44'.0	22° 13'.3 N	214° 20'.8	15° 14'.3 S
01	95° 53'.9	156° 22'.6	22'.5	273° 09'.9	56'.9	345° 46'.7	13'.4	229° 23'.0	14'.4
02	110° 56'.4	171° 24'.2	21'.9	288° 11'.2	56'.4	0° 49'.5	13'.4	244° 25'.1	14'.5
03	125° 58'.9	186° 25'.8	21'.4	303° 12'.5	55'.9	15° 52'.2	13'.5	259° 27'.3	14'.5
04	141° 01'.3	201° 27'.4	20'.8	318° 13'.8	55'.4	30° 55'.0	13'.5	274° 29'.5	14'.6
05	156° 03'.8	216° 29'.0	20'.3	333° 15'.1	55'.0	45° 57'.7	13'.6	289° 31'.7	14'.7
06	171° 06'.3	231° 30'.6	19'.7	348° 16'.4	54'.5	61° 00'.5	13'.6	304° 33'.9	14'.8
07	186° 08'.7	246° 32'.2	19'.2	3° 17'.7	54'.0	76° 03'.2	13'.6	319° 36'.1	14'.8
08	201° 11'.2	261° 33'.8	18'.6	18° 19'.0	53'.5	91° 06'.0	13'.7	334° 38'.3	14'.9
09	216° 13'.7	276° 35'.4	18'.1	33° 20'.3	53'.1	106° 08'.7	13'.7	349° 40'.5	15'.0
10	231° 16'.1	291° 37'.0	17'.6	48° 21'.6	52'.6	121° 11'.5	13'.8	4° 42'.7	15'.0
11	246° 18'.6	306° 38'.6	17'.0	63° 22'.9	52'.1	136° 14'.2	13'.8	19° 44'.9	15'.1
12	261° 21'.0	321° 40'.2	22° 16'.5 S	78° 24'.2	0° 51'.6 N	151° 16'.9	22° 13'.9 N	34° 47'.1	15° 15'.2 S
13	276° 23'.5	336° 41'.9	15'.9	93° 25'.5	51'.2	166° 19'.7	13'.9	49° 49'.3	15'.2
14	291° 26'.0	351° 43'.5	15'.4	108° 26'.8	50'.7	181° 22'.4	13'.9	64° 51'.5	15'.3
15	306° 28'.4	6° 45'.1	14'.8	123° 28'.1	50'.2	196° 25'.2	14'.0	79° 53'.7	15'.4
16	321° 30'.9	21° 46'.8	14'.3	138° 29'.4	49'.7	211° 27'.9	14'.0	94° 55'.9	15'.5
17	336° 33'.4	36° 48'.4	13'.7	153° 30'.7	49'.3	226° 30'.7	14'.1	109° 58'.1	15'.5
18	351° 35'.8	51° 50'.1	13'.2	168° 32'.0	48'.8	241° 33'.4	14'.1	125° 00'.3	15'.6
19	6° 38'.3	66° 51'.7	12'.6	183° 33'.3	48'.3	256° 36'.2	14'.2	140° 02'.5	15'.7
20	21° 40'.8	81° 53'.4	12'.1	198° 34'.6	47'.8	271° 38'.9	14'.2	155° 04'.7	15'.7
21	36° 43'.2	96° 55'.0	11'.5	213° 35'.9	47'.4	286° 41'.7	14'.2	170° 06'.9	15'.8
22	51° 45'.7	111° 56'.7	11'.0	228° 37'.2	46'.9	301° 44'.4	14'.3	185° 09'.0	15'.9
23	66° 48'.1	126° 58'.4	10'.4	243° 38'.5	46'.4	316° 47'.2	14'.3	200° 11'.2	15'.9
13 Friday 00	81° 50'.6	142° 00'.0	22° 09'.9 S	258° 39'.8	0° 45'.9 N	331° 49'.9	22° 14'.4 N	215° 13'.4	15° 16'.0 S
01	96° 53'.1	157° 01'.7	09'.3	273° 41'.1	45'.5	346° 52'.7	14'.4	230° 15'.6	16'.1
02	111° 55'.5	172° 03'.4	08'.8	288° 42'.4	45'.0	1° 55'.4	14'.4	245° 17'.8	16'.2
03	126° 58'.0	187° 05'.1	08'.2	303° 43'.7	44'.5	16° 58'.2	14'.5	260° 20'.0	16'.2
04	142° 00'.5	202° 06'.8	07'.7	318° 45'.0	44'.0	32° 01'.0	14'.5	275° 22'.2	16'.3
05	157° 02'.9	217° 08'.4	07'.2	333° 46'.3	43'.6	47° 03'.7	14'.6	290° 24'.4	16'.4
06	172° 05'.4	232° 10'.1	06'.6	348° 47'.6	43'.1	62° 06'.5	14'.6	305° 26'.6	16'.4
07	187° 07'.9	247° 11'.8	06'.1	3° 48'.9	42'.6	77° 09'.2	14'.7	320° 28'.8	16'.5
08	202° 10'.3	262° 13'.5	05'.5	18° 50'.3	42'.1	92° 12'.0	14'.7	335° 31'.0	16'.6
09	217° 12'.8	277° 15'.2	05'.0	33° 51'.6	41'.7	107° 14'.7	14'.7	350° 33'.2	16'.6
10	232° 15'.3	292° 16'.9	04'.4	48° 52'.9	41'.2	122° 17'.5	14'.8	5° 35'.4	16'.7
11	247° 17'.7	307° 18'.7	03'.9	63° 54'.2	40'.7	137° 20'.2	14'.8	20° 37'.6	16'.8
12	262° 20'.2	322° 20'.4	22° 03'.3 S	78° 55'.5	0° 40'.2 N	152° 23'.0	22° 14'.9 N	35° 39'.8	15° 16'.9 S
13	277° 22'.6	337° 22'.1	02'.8	93° 56'.8	39'.8	167° 25'.7	14'.9	50° 42'.0	16'.9
14	292° 25'.1	352° 23'.8	02'.2	108° 58'.1	39'.3	182° 28'.5	15'.0	65° 44'.2	17'.0
15	307° 27'.6	7° 25'.5	01'.7	123° 59'.4	38'.8	197° 31'.2	15'.0	80° 46'.4	17'.1
16	322° 30'.0	22° 27'.3	01'.1	139° 00'.7	38'.3	212° 34'.0	15'.0	95° 48'.6	17'.1
17	337° 32'.5	37° 29'.0	00'.6	154° 02'.0	37'.9	227° 36'.8	15'.1	110° 50'.8	17'.2
18	352° 35'.0	52° 30'.8	00'.0	169° 03'.3	37'.4	242° 39'.5	15'.1	125° 53'.0	17'.3
19	7° 37'.4	67° 32'.5	21° 59'.5 S	184° 04'.6	36'.9	257° 42'.3	15'.2	140° 55'.2	17'.3
20	22° 39'.9	82° 34'.3	58'.9	199° 05'.9	36'.5	272° 45'.0	15'.2	155° 57'.4	17'.4
21	37° 42'.4	97° 36'.0	58'.4	214° 07'.2	36'.0	287° 47'.8	15'.3	170° 59'.6	17'.5
22	52° 44'.8	112° 37'.8	57'.8	229° 08'.5	35'.5	302° 50'.5	15'.3	186° 01'.8	17'.5
23	67° 47'.3	127° 39'.5	57'.3	244° 09'.8	35'.0	317° 53'.3	15'.3	201° 04'.0	17'.6
14 Saturday 00	82° 49'.8	142° 41'.3	21° 56'.7 S	259° 11'.1	0° 34'.6 N	332° 56'.0	22° 15'.4 N	216° 06'.2	15° 17'.7 S
01	97° 52'.2	157° 43'.1	56'.2	274° 12'.4	34'.1	347° 58'.8	15'.4	231° 08'.4	17'.8
02	112° 54'.7	172° 44'.8	55'.6	289° 13'.8	33'.6	3° 01'.6	15'.5	246° 10'.6	17'.8
03	127° 57'.1	187° 46'.6	55'.1	304° 15'.1	33'.2	18° 04'.3	15'.5	261° 12'.8	17'.9
04	142° 59'.6	202° 48'.4	54'.5	319° 16'.4	32'.7	33° 07'.1	15'.6	276° 14'.9	18'.0
05	158° 02'.1	217° 50'.2	54'.0	334° 17'.7	32'.2	48° 09'.8	15'.6	291° 17'.1	18'.0
06	173° 04'.5	232° 51'.9	53'.4	349° 19'.0	31'.7	63° 12'.6	15'.7	306° 19'.3	18'.1
07	188° 07'.0	247° 53'.7	52'.9	4° 20'.3	31'.3	78° 15'.4	15'.7	321° 21'.5	18'.2
08	203° 09'.5	262° 55'.5	52'.3	19° 21'.6	30'.8	93° 18'.1	15'.7	336° 23'.7	18'.2
09	218° 11'.9	277° 57'.3	51'.8	34° 22'.9	30'.3	108° 20'.9	15'.8	351° 25'.9	18'.3
10	233° 14'.4	292° 59'.1	51'.2	49° 24'.2	29'.9	123° 23'.6	15'.8	6° 28'.1	18'.4
11	248° 16'.9	308° 00'.9	50'.7	64° 25'.5	29'.4	138° 26'.4	15'.9	21° 30'.3	18'.4
12	263° 19'.3	323° 02'.8	21° 50'.1 S	79° 26'.8	0° 28'.9 N	153° 29'.2	22° 15'.9 N	36° 32'.5	15° 18'.5 S
13	278° 21'.8	338° 04'.6	49'.6	94° 28'.2	28'.4	168° 31'.9	16'.0	51° 34'.7	18'.6
14	293° 24'.3	353° 06'.4	49'.0	109° 29'.5	28'.0	183° 34'.7	16'.0	66° 36'.9	18'.7
15	308° 26'.7	8° 08'.2	48'.5	124° 30'.8	27'.5	198° 37'.4	16'.0	81° 39'.1	18'.7
16	323° 29'.2	23° 10'.0	47'.9	139° 32'.1	27'.0	213° 40'.2	16'.1	96° 41'.3	18'.8
17	338° 31'.6	38° 11'.9	47'.4	154° 33'.4	26'.6	228° 43'.0	16'.1	111° 43'.5	18'.9
18	353° 34'.1	53° 13'.7	46'.8	169° 34'.7	26'.1	243° 45'.7	16'.2	126° 45'.7	18'.9
19	8° 36'.6	68° 15'.6	46'.3	184° 36'.0	25'.6	258° 48'.5	16'.2	141° 47'.9	19'.0
20	23° 39'.0	83° 17'.4	45'.7	199° 37'.3	25'.2	273° 51'.2	16'.3	156° 50'.1	19'.1
21	38° 41'.5	98° 19'.2	45'.2	214° 38'.7	24'.7	288° 54'.0	16'.3	171° 52'.3	19'.1
22	53° 44'.0	113° 21'.1	44'.6	229° 40'.0	24'.2	303° 56'.8	16'.3	186° 54'.5	19'.2
23	68° 46'.4	128° 23'.0	44'.1	244° 41'.3	23'.7	318° 59'.5	16'.4	201° 56'.7	19'.3
	M.P. 18:30	v 1'.7	d 0'.5	v 1'.3	d 0'.5	v 2'.8	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 15'.1 S
Achernar	335° 26'.3	57° 10'.2 S
Acrux	173° 09'.0	63° 10'.3 S
Adhara	255° 11'.9	28° 59'.6 S
Aldebaran	290° 48'.6	16° 32'.1 N
Alioth	166° 20'.7	55° 52'.8 N
Alkaid	152° 59'.0	49° 14'.4 N
Alnair	27° 43'.5	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.7 S
Alphard	217° 55'.6	8° 43'.2 S
Alphecca	126° 11'.1	26° 40'.1 N
Alpheratz	357° 43'.0	29° 10'.3 N
Altair	62° 08'.2	8° 54'.6 N
Ankaa	353° 15'.3	42° 14'.0 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.7	19° 06'.6 N
Atria	107° 28'.2	69° 02'.9 S
Avior	234° 17'.3	59° 33'.2 S
Bellatrix	278° 31'.3	6° 21'.6 N
Betelgeuse	271° 00'.6	7° 24'.4 N
Canopus	263° 55'.4	52° 42'.3 S
Capella	280° 33'.4	46° 00'.6 N
Deneb	49° 31'.5	45° 20'.2 N
Denebola	182° 33'.4	14° 29'.5 N
Diphda	348° 55'.4	17° 54'.7 S
Dubhe	193° 51'.3	61° 40'.1 N
Elnath	278° 11'.8	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.4 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.7	29° 32'.9 S
Gacrux	172° 00'.6	57° 11'.2 S
Gienah	175° 52'.0	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.2	74° 05'.7 N
Markab	13° 38'.0	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.4	36° 26'.1 S
Miaplacidus	221° 38'.9	69° 46'.3 S
Mirfak	308° 39'.3	49° 54'.7 N
Nunki	75° 58'.3	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.4 S
Polaris	317° 13'.0	89° 19'.6 N
Pollux	243° 27'.0	27° 59'.3 N
Procyon	244° 59'.1	5° 11'.1 N
Rasalhague	96° 06'.5	12° 33'.2 N
Regulus	207° 43'.0	11° 53'.7 N
Rigel	281° 11'.4	8° 11'.3 S
Rigil Kent	139° 51'.7	60° 53'.2 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.8	56° 37'.1 N
Shaula	96° 21'.9	37° 06'.6 S
Sirius	258° 33'.1	16° 44'.3 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 51'.9	43° 29'.3 S
Vega	80° 39'.1	38° 48'.1 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	60° 09'.4	14:30
Mars	176° 49'.2	06:45
Jupiter	249° 59'.3	01:52
Saturn	133° 22'.8	09:38

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
181° 36'.5	23° 04'.0 S	63° 55'.4	12'.3	8° 55'.9 N	9'.7	56'.6
196° 36'.2	04'.2	78° 26'.7	12'.3	9° 05'.6 N	9'.6	56'.5
211° 35'.9	04'.4	92° 58'.0	12'.3	15'.2	9'.5	
226° 35'.6	04'.6	107° 29'.3	12'.3	24'.7	9'.5	
241° 35'.3	04'.8	122° 00'.6	12'.3	34'.2	9'.4	
256° 35'.0	05'.0	136° 31'.9	12'.3	43'.6	9'.4	56'.4
271° 34'.7	05'.1	151° 03'.2	12'.3	53'.0	9'.4	
286° 34'.4	05'.3	165° 34'.5	12'.3	10° 02'.4 N	9'.2	
301° 34'.1	05'.5	180° 05'.8	12'.3	11'.6	9'.2	
316° 33'.9	05'.7	194° 37'.1	12'.3	20'.8	9'.2	56'.3
331° 33'.6	05'.9	209° 08'.4	12'.2	30'.0	9'.1	
346° 33'.3	06'.1	223° 39'.6	12'.3	39'.1	9'.0	
1° 33'.0	23° 06'.2 S	238° 10'.9	12'.3	10° 48'.1 N	9'.0	56'.3
16° 32'.7	06'.4	252° 42'.2	12'.2	57'.1	9'.0	56'.2
31° 32'.4	06'.6	267° 13'.4	12'.3	11° 06'.1 N	8'.8	
46° 32'.1	06'.8	281° 44'.7	12'.2	14'.9	8'.8	
61° 31'.8	06'.9	296° 15'.9	12'.2	23'.7	8'.8	
76° 31'.5	07'.1	310° 47'.1	12'.2	32'.5	8'.6	56'.1
91° 31'.2	07'.3	325° 18'.3	12'.2	41'.1	8'.7	
106° 30'.9	07'.5	339° 49'.5	12'.2	49'.8	8'.5	
121° 30'.6	07'.6	354° 20'.7	12'.2	58'.3	8'.5	
136° 30'.4	07'.8	8° 51'.9	12'.2	12° 06'.8 N	8'.4	56'.0
151° 30'.1	08'.0	23° 23'.1	12'.2	15'.2	8'.4	
166° 29'.8	08'.2	37° 54'.3	12'.1	23'.6	8'.3	
181° 29'.5	23° 08'.3 S	52° 25'.4	12'.2	12° 31'.9 N	8'.2	56'.0
196° 29'.2	08'.5	66° 56'.6	12'.1	40'.1	8'.2	
211° 28'.9	08'.7	81° 27'.7	12'.1	48'.3	8'.1	55'.9
226° 28'.6	08'.8	95° 58'.8	12'.2	56'.4	8'.0	
241° 28'.3	09'.0	110° 30'.0	12'.1	13° 04'.4 N	8'.0	
256° 28'.0	09'.2	125° 01'.1	12'.0	12'.4	7'.9	
271° 27'.7	09'.3	139° 32'.1	12'.1	20'.3	7'.8	55'.8
286° 27'.4	09'.5	154° 03'.2	12'.1	28'.1	7'.7	
301° 27'.1	09'.7	168° 34'.3	12'.0	35'.8	7'.7	
316° 26'.8	09'.8	183° 05'.3	12'.1	43'.5	7'.6	
331° 26'.5	10'.0	197° 36'.4	12'.0	51'.1	7'.5	
346° 26'.2	10'.1	212° 07'.4	12'.0	58'.6	7'.5	55'.7
1° 25'.9	23° 10'.3 S	226° 38'.4	12'.0	14° 06'.1 N	7'.4	55'.7
16° 25'.6	10'.5	241° 09'.4	12'.0	13'.5	7'.3	
31° 25'.3	10'.6	255° 40'.4	12'.0	20'.8	7'.3	
46° 25'.1	10'.8	270° 11'.4	11'.9	28'.1	7'.1	
61° 24'.8	10'.9	284° 42'.3	12'.0	35'.2	7'.1	55'.6
76° 24'.5	11'.1	299° 13'.3	11'.9	42'.3	7'.1	
91° 24'.2	11'.2	313° 44'.2	11'.9	49'.4	6'.9	
106° 23'.9	11'.4	328° 15'.1	12'.0	56'.3	6'.9	
121° 23'.6	11'.6	342° 46'.1	11'.8	15° 03'.2 N	6'.8	55'.5
136° 23'.3	11'.7	357° 16'.9	11'.9	10'.0	6'.7	
151° 23'.0	11'.9	11° 47'.8	11'.9	16'.7	6'.6	
166° 22'.7	12'.0	26° 18'.7	11'.8	23'.3	6'.6	
181° 22'.4	23° 12'.2 S	40° 49'.5	11'.9	15° 29'.9 N	6'.5	55'.5
196° 22'.1	12'.3	55° 20'.4	11'.8	36'.4	6'.4	
211° 21'.8	12'.5	69° 51'.2	11'.8	42'.8	6'.3	55'.4
226° 21'.5	12'.6	84° 22'.0	11'.8	49'.1	6'.2	
241° 21'.2	12'.8	98° 52'.8	11'.8	55'.3	6'.2	
256° 20'.9	12'.9	113° 23'.6	11'.8	16° 01'.5 N	6'.1	
271° 20'.6	13'.1	127° 54'.4	11'.7	07'.6	6'.0	
286° 20'.3	13'.2	142° 25'.1	11'.8	13'.6	5'.9	55'.3
301° 20'.0	13'.3	156° 55'.9	11'.7	19'.5	5'.8	
316° 19'.7	13'.5	171° 26'.6	11'.7	25'.3	5'.8	
331° 19'.4	13'.6	185° 57'.3	11'.7	31'.1	5'.6	
346° 19'.1	13'.8	200° 28'.0	11'.7	36'.7	5'.6	
1° 18'.8	23° 13'.9 S	214° 58'.7	11'.7	16° 42'.3 N	5'.5	55'.2
16° 18'.5	14'.0	229° 29'.4	11'.6	47'.8	5'.4	
31° 18'.2	14'.2	244° 00'.0	11'.7	53'.2	5'.4	
46° 17'.9	14'.3	258° 30'.7	11'.6	58'.6	5'.2	
61° 17'.6	14'.5	273° 01'.3	11'.7	17° 03'.8 N	5'.2	
76° 17'.3	14'.6	287° 32'.0	11'.6	09'.0	5'.1	
91° 17'.0	14'.7	302° 02'.6	11'.6	14'.1	5'.0	55'.1
106° 16'.7	14'.9	316° 33'.2	11'.6	19'.1	4'.9	
121° 16'.4	15'.0	331° 03'.8	11'.6	24'.0	4'.8	
136° 16'.1	15'.1	345° 34'.4	11'.6	28'.8	4'.7	
151° 15'.8	15'.3	0° 05'.0	11'.5	33'.5	4'.7	
166° 15'.5	15'.4	14° 35'.5	11'.6	38'.2	4'.5	
SD 16'.2	d 0'.2	SD	15'.3	15'.2	15'.1	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 12	Moonrise 13	Moonrise 14
N 72°	08:17	10:41	-	11:45	11:33	11:15
N 70°	07:58	09:44	-	12:02	12:01	12:00
68°	07:42	09:10	-	12:16	12:21	12:30
66°	07:30	08:46	10:23	12:27	12:38	12:53
64°	07:19	08:27	09:43	12:37	12:51	13:11
62°	07:09	08:11	09:16	12:45	13:03	13:25
60°	07:01	07:58	08:55	12:52	13:12	13:38
N 58°	06:54	07:46	08:38	12:58	13:21	13:48
56°	06:47	07:36	08:23	13:03	13:28	13:58
54°	06:41	07:27	08:11	13:08	13:35	14:06
52°	06:36	07:19	08:00	13:13	13:41	14:14
50°	06:30	07:12	07:50	13:17	13:47	14:20
45°	06:19	06:56	07:30	13:26	13:59	14:35
N 40°	06:09	06:43	07:13	13:33	14:09	14:47
35°	06:00	06:31	06:59	13:40	14:17	14:57
30°	05:51	06:21	06:47	13:45	14:25	15:06
20°	05:35	06:02	06:26	13:55	14:38	15:22
N 10°	05:19	05:45	06:08	14:04	14:49	15:35
0°	05:02	05:28	05:51	14:12	15:00	15:48
S 10°	04:43	05:10	05:33	14:20	15:10	16:01
20°	04:21	04:50	05:14	14:29	15:22	16:15
30°	03:52	04:25	04:53	14:39	15:35	16:30
35°	03:34	04:10	04:40	14:45	15:43	16:40
40°	03:11	03:52	04:25	14:52	15:52	16:50
45°	02:41	03:30	04:07	15:00	16:02	17:03
S 50°	01:56	03:01	03:45	15:09	16:15	17:18
52°	01:30	02:46	03:34	15:13	16:21	17:25
54°	00:48	02:28	03:22	15:18	16:27	17:33
56°	-	02:07	03:08	15:24	16:34	17:41
58°	-	01:38	02:52	15:30	16:43	17:51
S 60°	-	00:53	02:32	15:36	16:52	18:03
S 62°	-	-	02:07	15:44	17:03	18:16

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 12	Moonset 13	Moonset 14
N 72°	-	13:07	15:31	03:55	05:46	07:45
N 70°	-	14:04	15:50	03:39	05:20	07:01
68°	-	14:38	16:06	03:27	05:00	06:31
66°	13:25	15:02	16:19	03:17	04:45	06:09
64°	14:05	15:21	16:29	03:09	04:32	05:52
62°	14:32	15:37	16:39	03:02	04:22	05:38
60°	14:53	15:51	16:47	02:56	04:12	05:26
N 58°	15:11	16:02	16:54	02:50	04:05	05:16
56°	15:25	16:12	17:01	02:45	03:58	05:07
54°	15:37	16:21	17:07	02:41	03:51	04:59
52°	15:48	16:29	17:13	02:37	03:46	04:52
50°	15:58	16:36	17:18	02:34	03:41	04:45
45°	16:19	16:52	17:29	02:26	03:30	04:31
N 40°	16:35	17:06	17:40	02:20	03:21	04:20
35°	16:49	17:17	17:49	02:14	03:13	04:10
30°	17:01	17:28	17:58	02:10	03:06	04:02
20°	17:22	17:46	18:14	02:01	02:55	03:47
N 10°	17:41	18:04	18:30	01:54	02:44	03:35
0°	17:58	18:21	18:47	01:47	02:35	03:23
S 10°	18:15	18:38	19:05	01:40	02:25	03:11
20°	18:34	18:59	19:28	01:33	02:15	02:58
30°	18:56	19:23	19:57	01:25	02:04	02:44
35°	19:09	19:39	20:15	01:20	01:57	02:36
40°	19:24	19:57	20:38	01:15	01:49	02:26
45°	19:42	20:19	21:08	01:09	01:41	02:15
S 50°	20:04	20:48	21:53	01:02	01:30	02:02
52°	20:15	21:03	22:20	00:58	01:25	01:55
54°	20:27	21:21	23:03	00:54	01:20	01:48
56°	20:41	21:42	-	00:50	01:14	01:41
58°	20:57	22:11	-	00:46	01:07	01:32
S 60°	21:17	22:58	-	00:41	01:00	01:22
S 62°	21:43	-	-	00:35	00:51	01:11

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
12	6 26	6 13	11:54	20:23	08:00	9d 79%
13	5 58	5 44	11:54	21:11	08:47	10d 86%
14	5 30	5 16	11:55	22:00	09:35	11d 92%

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2013 December 15, 16, 17 (Sun, Mon, Te)

GMT	ARIES	VENUS -4.7		MARS +1.1		JUPITER -2.7		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
15 Sunday 00	83° 48'.9	143° 24'.8	21° 43'.5 S	259° 42'.6	0° 23'.3 N	334° 02'.3	22° 16'.4 N	216° 58'.9	15° 19'.3 S
01	98° 51'.4	158° 26'.7	43'.0	274° 43'.9	22'.8	349° 05'.1	16'.5	232° 01'.1	19'.4
02	113° 53'.8	173° 28'.5	42'.4	289° 45'.2	22'.3	4° 07'.8	16'.5	247° 03'.3	19'.5
03	128° 56'.3	188° 30'.4	41'.9	304° 46'.5	21'.9	19° 10'.6	16'.6	262° 05'.5	19'.5
04	143° 58'.7	203° 32'.3	41'.3	319° 47'.8	21'.4	34° 13'.3	16'.6	277° 07'.7	19'.6
05	159° 01'.2	218° 34'.2	40'.8	334° 49'.2	20'.9	49° 16'.1	16'.7	292° 09'.9	19'.7
06	174° 03'.7	233° 36'.1	40'.2	349° 50'.5	20'.5	64° 18'.9	16'.7	307° 12'.1	19'.7
07	189° 06'.1	248° 37'.9	39'.7	4° 51'.8	20'.0	79° 21'.6	16'.7	322° 14'.3	19'.8
08	204° 08'.6	263° 39'.8	39'.1	19° 53'.1	19'.5	94° 24'.4	16'.8	337° 16'.5	19'.9
09	219° 11'.1	278° 41'.7	38'.6	34° 54'.4	19'.1	109° 27'.2	16'.8	352° 18'.7	20'.0
10	234° 13'.5	293° 43'.6	38'.0	49° 55'.7	18'.6	124° 29'.9	16'.9	7° 20'.9	20'.0
11	249° 16'.0	308° 45'.5	37'.5	64° 57'.1	18'.1	139° 32'.7	16'.9	22° 23'.1	20'.1
12	264° 18'.5	323° 47'.5	21° 36'.9 S	79° 58'.4	0° 17'.7 N	154° 35'.5	22° 17'.0 N	37° 25'.3	15° 20'.2 S
13	279° 20'.9	338° 49'.4	36'.4	94° 59'.7	17'.2	169° 38'.2	17'.0	52° 27'.5	20'.2
14	294° 23'.4	353° 51'.3	35'.8	110° 01'.0	16'.7	184° 41'.0	17'.0	67° 29'.7	20'.3
15	309° 25'.9	8° 53'.2	35'.3	125° 02'.3	16'.3	199° 43'.8	17'.1	82° 31'.9	20'.4
16	324° 28'.3	23° 55'.1	34'.7	140° 03'.6	15'.8	214° 46'.5	17'.1	97° 34'.1	20'.4
17	339° 30'.8	38° 57'.1	34'.2	155° 05'.0	15'.3	229° 49'.3	17'.2	112° 36'.3	20'.5
18	354° 33'.2	53° 59'.0	33'.6	170° 06'.3	14'.8	244° 52'.1	17'.2	127° 38'.5	20'.6
19	9° 35'.7	69° 00'.9	33'.1	185° 07'.6	14'.4	259° 54'.8	17'.3	142° 40'.7	20'.6
20	24° 38'.2	84° 02'.9	32'.5	200° 08'.9	13'.9	274° 57'.6	17'.3	157° 42'.9	20'.7
21	39° 40'.6	99° 04'.8	32'.0	215° 10'.2	13'.4	290° 00'.4	17'.4	172° 45'.1	20'.8
22	54° 43'.1	114° 06'.8	31'.4	230° 11'.5	13'.0	305° 03'.1	17'.4	187° 47'.3	20'.8
23	69° 45'.6	129° 08'.7	30'.9	245° 12'.9	12'.5	320° 05'.9	17'.4	202° 49'.5	20'.9
16 Monday 00	84° 48'.0	144° 10'.7	21° 30'.3 S	260° 14'.2	0° 12'.1 N	335° 08'.7	22° 17'.5 N	217° 51'.7	15° 21'.0 S
01	99° 50'.5	159° 12'.6	29'.8	275° 15'.5	11'.6	350° 11'.4	17'.5	232° 53'.9	21'.0
02	114° 53'.0	174° 14'.6	29'.2	290° 16'.8	11'.1	5° 14'.2	17'.6	247° 56'.1	21'.1
03	129° 55'.4	189° 16'.6	28'.7	305° 18'.1	10'.7	20° 17'.0	17'.6	262° 58'.3	21'.2
04	144° 57'.9	204° 18'.6	28'.1	320° 19'.5	10'.2	35° 19'.7	17'.7	278° 00'.5	21'.2
05	160° 00'.4	219° 20'.5	27'.6	335° 20'.8	09'.7	50° 22'.5	17'.7	293° 02'.7	21'.3
06	175° 02'.8	234° 22'.5	27'.0	350° 22'.1	09'.3	65° 25'.3	17'.8	308° 04'.9	21'.4
07	190° 05'.3	249° 24'.5	26'.5	5° 23'.4	08'.8	80° 28'.0	17'.8	323° 07'.1	21'.4
08	205° 07'.7	264° 26'.5	25'.9	20° 24'.7	08'.3	95° 30'.8	17'.8	338° 09'.3	21'.5
09	220° 10'.2	279° 28'.5	25'.4	35° 26'.1	07'.9	110° 33'.6	17'.9	353° 11'.5	21'.6
10	235° 12'.7	294° 30'.5	24'.8	50° 27'.4	07'.4	125° 36'.4	17'.9	8° 13'.7	21'.6
11	250° 15'.1	309° 32'.5	24'.3	65° 28'.7	06'.9	140° 39'.1	18'.0	23° 15'.9	21'.7
12	265° 17'.6	324° 34'.5	21° 23'.7 S	80° 30'.0	0° 06'.5 N	155° 41'.9	22° 18'.0 N	38° 18'.1	15° 21'.8 S
13	280° 20'.1	339° 36'.5	23'.2	95° 31'.3	06'.0	170° 44'.7	18'.1	53° 20'.3	21'.9
14	295° 22'.5	354° 38'.5	22'.6	110° 32'.7	05'.5	185° 47'.4	18'.1	68° 22'.5	21'.9
15	310° 25'.0	9° 40'.6	22'.1	125° 34'.0	05'.1	200° 50'.2	18'.1	83° 24'.7	22'.0
16	325° 27'.5	24° 42'.6	21'.5	140° 35'.3	04'.6	215° 53'.0	18'.2	98° 26'.9	22'.1
17	340° 29'.9	39° 44'.6	21'.0	155° 36'.6	04'.1	230° 55'.8	18'.2	113° 29'.1	22'.1
18	355° 32'.4	54° 46'.7	20'.4	170° 38'.0	03'.7	245° 58'.5	18'.3	128° 31'.3	22'.2
19	10° 34'.9	69° 48'.7	19'.9	185° 39'.3	03'.2	261° 01'.3	18'.3	143° 33'.5	22'.3
20	25° 37'.3	84° 50'.7	19'.3	200° 40'.6	02'.8	276° 04'.1	18'.4	158° 35'.8	22'.3
21	40° 39'.8	99° 52'.8	18'.8	215° 41'.9	02'.3	291° 06'.8	18'.4	173° 38'.0	22'.4
22	55° 42'.2	114° 54'.8	18'.2	230° 43'.3	01'.8	306° 09'.6	18'.5	188° 40'.2	22'.5
23	70° 44'.7	129° 56'.9	17'.7	245° 44'.6	01'.4	321° 12'.4	18'.5	203° 42'.4	22'.5
17 Tuesday 00	85° 47'.2	144° 58'.9	21° 17'.1 S	260° 45'.9	0° 00'.9 N	336° 15'.2	22° 18'.5 N	218° 44'.6	15° 22'.6 S
01	100° 49'.6	160° 01'.0	16'.6	275° 47'.2	00'.4	351° 17'.9	18'.6	233° 46'.8	22'.7
02	115° 52'.1	175° 03'.1	16'.0	290° 48'.6	00'.0	6° 20'.7	18'.6	248° 49'.0	22'.7
03	130° 54'.6	190° 05'.1	15'.5	305° 49'.9	00'.5	21° 23'.5	18'.7	263° 51'.2	22'.8
04	145° 57'.0	205° 07'.2	14'.9	320° 51'.2	01'.0	36° 26'.3	18'.7	278° 53'.4	22'.9
05	160° 59'.5	220° 09'.3	14'.4	335° 52'.5	01'.4	51° 29'.0	18'.8	293° 55'.6	22'.9
06	176° 02'.0	235° 11'.4	13'.8	350° 53'.9	01'.9	66° 31'.8	18'.8	308° 57'.8	23'.0
07	191° 04'.4	250° 13'.5	13'.3	5° 55'.2	02'.3	81° 34'.6	18'.9	324° 00'.0	23'.1
08	206° 06'.9	265° 15'.6	12'.7	20° 56'.5	02'.8	96° 37'.4	18'.9	339° 02'.2	23'.1
09	221° 09'.4	280° 17'.7	12'.2	35° 57'.8	03'.3	111° 40'.1	18'.9	354° 04'.4	23'.2
10	236° 11'.8	295° 19'.8	11'.6	50° 59'.2	03'.7	126° 42'.9	19'.0	9° 06'.6	23'.3
11	251° 14'.3	310° 21'.9	11'.1	66° 00'.5	04'.2	141° 45'.7	19'.0	24° 08'.8	23'.3
12	266° 16'.7	325° 24'.0	21° 10'.6 S	81° 01'.8	0° 04'.6 S	156° 48'.5	22° 19'.1 N	39° 11'.0	15° 23'.4 S
13	281° 19'.2	340° 26'.1	10'.0	96° 03'.2	05'.1	171° 51'.2	19'.1	54° 13'.2	23'.5
14	296° 21'.7	355° 28'.2	09'.5	111° 04'.5	05'.6	186° 54'.0	19'.2	69° 15'.4	23'.5
15	311° 24'.1	10° 30'.3	08'.9	126° 05'.8	06'.0	201° 56'.8	19'.2	84° 17'.6	23'.6
16	326° 26'.6	25° 32'.5	08'.4	141° 07'.1	06'.5	216° 59'.6	19'.3	99° 19'.8	23'.7
17	341° 29'.1	40° 34'.6	07'.8	156° 08'.5	07'.0	232° 02'.3	19'.3	114° 22'.0	23'.7
18	356° 31'.5	55° 36'.7	07'.3	171° 09'.8	07'.4	247° 05'.1	19'.4	129° 24'.2	23'.8
19	11° 34'.0	70° 38'.9	06'.7	186° 11'.1	07'.9	262° 07'.9	19'.4	144° 26'.4	23'.9
20	26° 36'.5	85° 41'.0	06'.2	201° 12'.5	08'.3	277° 10'.7	19'.4	159° 28'.6	23'.9
21	41° 38'.9	100° 43'.2	05'.6	216° 13'.8	08'.8	292° 13'.5	19'.5	174° 30'.8	24'.0
22	56° 41'.4	115° 45'.3	05'.1	231° 15'.1	09'.3	307° 16'.2	19'.5	189° 33'.0	24'.1
23	71° 43'.8	130° 47'.5	04'.5	246° 16'.5	09'.7	322° 19'.0	19'.6	204° 35'.2	24'.1
	M.P. 18:18	v 2'.0	d 0'.5	v 1'.3	d 0'.5	v 2'.8	d 0'.0	v 2'.2	d 0'.1

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 17'.8	40° 15'.1 S	181° 15'.2	23° 15'.5 S	29° 06'.1	11'.5	17° 42'.7 N	4'.5	55'.0
Achernar	335° 26'.3	57° 10'.2 S	196° 14'.9	15'.7	43° 36'.6	11'.5	47'.2	4'.4	
Acrux	173° 09'.0	63° 10'.3 S	211° 14'.6	15'.8	58° 07'.1	11'.6	51'.6	4'.3	
Adhara	255° 11'.9	28° 59'.6 S	226° 14'.3	15'.9	72° 37'.7	11'.5	55'.9	4'.2	
Aldebaran	290° 48'.6	16° 32'.1 N	241° 14'.0	16'.1	87° 08'.2	11'.5	18° 00'.1 N	4'.1	
			256° 13'.7	16'.2	101° 38'.7	11'.5	04'.2	4'.0	
Alioth	166° 20'.7	55° 52'.8 N	271° 13'.4	16'.3	116° 09'.2	11'.5	08'.2	4'.0	54'.9
Alkaid	152° 59'.0	49° 14'.4 N	286° 13'.1	16'.4	130° 39'.7	11'.5	12'.2	3'.8	
Alnair	27° 43'.5	46° 53'.7 S	301° 12'.8	16'.6	145° 10'.2	11'.4	16'.0	3'.8	
Alnilam	275° 45'.7	1° 11'.8 S	316° 12'.5	16'.7	159° 40'.6	11'.5	19'.8	3'.6	
Alphard	217° 55'.5	8° 43'.3 S	331° 12'.2	16'.8	174° 11'.1	11'.5	23'.4	3'.6	
			346° 11'.9	16'.9	188° 41'.6	11'.4	27'.0	3'.5	
Alphecca	126° 11'.1	26° 40'.1 N	1° 11'.6	23° 17'.1 S	203° 12'.0	11'.5	18° 30'.5 N	3'.4	54'.8
Alpheratz	357° 43'.0	29° 10'.3 N	16° 11'.3	17'.2	217° 42'.5	11'.4	33'.9	3'.3	
Altair	62° 08'.2	8° 54'.6 N	31° 11'.0	17'.3	232° 12'.9	11'.5	37'.2	3'.2	
Ankaa	353° 15'.3	42° 14'.0 S	46° 10'.7	17'.4	246° 43'.4	11'.4	40'.4	3'.1	
Antares	112° 26'.2	26° 27'.6 S	61° 10'.4	17'.5	261° 13'.8	11'.4	43'.5	3'.0	
			76° 10'.1	17'.7	275° 44'.2	11'.5	46'.5	3'.0	
Arcturus	145° 55'.7	19° 06'.6 N	91° 09'.8	17'.8	290° 14'.7	11'.4	49'.5	2'.8	
Atria	107° 28'.2	69° 02'.9 S	106° 09'.5	17'.9	304° 45'.1	11'.4	52'.3	2'.8	54'.7
Avior	234° 17'.3	59° 33'.2 S	121° 09'.2	18'.0	319° 15'.5	11'.4	55'.1	2'.6	
Bellatrix	278° 31'.3	6° 21'.6 N	136° 08'.9	18'.1	333° 45'.9	11'.5	57'.7	2'.6	
Betelgeuse	271° 00'.6	7° 24'.4 N	151° 08'.6	18'.2	348° 16'.4	11'.4	19° 00'.3 N	2'.4	
			166° 08'.3	18'.3	2° 46'.8	11'.4	02'.7	2'.4	
Canopus	263° 55'.4	52° 42'.3 S	181° 08'.0	23° 18'.5 S	17° 17'.2	11'.4	19° 05'.1 N	2'.3	54'.7
Capella	280° 33'.4	46° 00'.6 N	196° 07'.7	18'.6	31° 47'.6	11'.4	07'.4	2'.2	
Deneb	49° 31'.5	45° 20'.2 N	211° 07'.4	18'.7	46° 18'.0	11'.4	09'.6	2'.1	
Denebola	182° 33'.3	14° 29'.5 N	226° 07'.1	18'.8	60° 48'.4	11'.4	11'.7	2'.0	54'.6
Diphda	348° 55'.5	17° 54'.7 S	241° 06'.8	18'.9	75° 18'.8	11'.5	13'.7	1'.9	
			256° 06'.5	19'.0	89° 49'.3	11'.4	15'.6	1'.8	
Dubhe	193° 51'.3	61° 40'.1 N	271° 06'.2	19'.1	104° 19'.7	11'.4	17'.4	1'.8	
Elnath	278° 11'.8	28° 37'.0 N	286° 05'.9	19'.2	118° 50'.1	11'.4	19'.2	1'.6	
Eltanin	90° 46'.5	51° 29'.4 N	301° 05'.6	19'.3	133° 20'.5	11'.5	20'.8	1'.5	
Enif	33° 46'.9	9° 56'.6 N	316° 05'.3	19'.4	147° 51'.0	11'.4	22'.3	1'.5	
Fomalhaut	15° 23'.7	29° 32'.9 S	331° 05'.0	19'.5	162° 21'.4	11'.4	23'.8	1'.3	54'.5
			346° 04'.7	19'.6	176° 51'.8	11'.5	25'.1	1'.3	
Gacrux	172° 00'.5	57° 11'.2 S	1° 04'.4	23° 19'.7 S	191° 22'.3	11'.4	19° 26'.4 N	1'.2	54'.5
Gienah	175° 52'.0	17° 37'.1 S	16° 04'.1	19'.8	205° 52'.7	11'.5	27'.6	1'.0	
Hadar	148° 47'.7	60° 26'.1 S	31° 03'.8	19'.9	220° 23'.2	11'.4	28'.6	1'.0	
Hamal	328° 00'.1	23° 31'.8 N	46° 03'.5	20'.0	234° 53'.6	11'.5	29'.6	0'.9	
Kaus Aust.	83° 43'.8	34° 22'.5 S	61° 03'.2	20'.1	249° 24'.1	11'.5	30'.5	0'.8	
			76° 02'.9	20'.2	263° 54'.6	11'.4	31'.3	0'.7	
Kochab	137° 21'.1	74° 05'.7 N	91° 02'.6	20'.3	278° 25'.0	11'.5	32'.0	0'.6	
Markab	13° 38'.0	15° 17'.0 N	106° 02'.3	20'.4	292° 55'.5	11'.5	32'.6	0'.5	54'.4
Menkar	314° 14'.4	4° 08'.6 N	121° 02'.0	20'.5	307° 26'.0	11'.5	33'.1	0'.4	
Menkent	148° 07'.4	36° 26'.1 S	136° 01'.7	20'.6	321° 56'.5	11'.6	33'.5	0'.3	
Miaplacidus	221° 38'.9	69° 46'.4 S	151° 01'.4	20'.7	336° 27'.1	11'.5	33'.8	0'.2	
			166° 01'.0	20'.8	350° 57'.6	11'.5	34'.0	0'.2	
Mirfak	308° 39'.3	49° 54'.7 N	181° 00'.7	23° 20'.9 S	5° 28'.1	11'.6	19° 34'.2 N	0'.0	54'.4
Nunki	75° 58'.3	26° 16'.6 S	196° 00'.4	21'.0	19° 58'.7	11'.6	34'.2	0'.0	
Peacock	53° 19'.2	56° 41'.4 S	211° 00'.1	21'.1	34° 29'.3	11'.5	34'.2	0'.2	
Polaris	317° 13'.6	89° 19'.6 N	225° 59'.8	21'.2	48° 59'.8	11'.6	34'.0	0'.2	
Pollux	243° 27'.0	27° 59'.3 N	240° 59'.5	21'.3	63° 30'.4	11'.6	33'.8	0'.3	54'.3
			255° 59'.2	21'.3	78° 01'.0	11'.6	33'.5	0'.5	
Procyon	244° 59'.1	5° 11'.1 N	270° 58'.9	21'.4	92° 31'.6	11'.7	33'.0	0'.5	
Rasalhague	96° 06'.5	12° 33'.2 N	285° 58'.6	21'.5	107° 02'.3	11'.6	32'.5	0'.6	
Regulus	207° 43'.0	11° 53'.7 N	300° 58'.3	21'.6	121° 32'.9	11'.7	31'.9	0'.7	
Rigel	281° 11'.4	8° 11'.3 S	315° 58'.0	21'.7	136° 03'.6	11'.7	31'.2	0'.8	
Rigil Kent	139° 51'.6	60° 53'.2 S	330° 57'.7	21'.8	150° 34'.3	11'.7	30'.4	0'.9	
			345° 57'.4	21'.9	165° 05'.0	11'.7	29'.5	0'.9	
Sabik	102° 12'.5	15° 44'.3 S	0° 57'.1	23° 21'.9 S	179° 35'.7	11'.7	19° 28'.6 N	1'.1	54'.3
Schedar	349° 39'.9	56° 37'.1 N	15° 56'.8	22'.0	194° 06'.4	11'.8	27'.5	1'.2	
Shaula	96° 21'.9	37° 06'.6 S	30° 56'.5	22'.1	208° 37'.2	11'.7	26'.3	1'.2	54'.2
Sirius	258° 33'.1	16° 44'.3 S	45° 56'.2	22'.2	223° 07'.9	11'.8	25'.1	1'.4	
Spica	158° 31'.0	11° 14'.0 S	60° 55'.9	22'.3	237° 38'.7	11'.8	23'.7	1'.4	
			75° 55'.6	22'.3	252° 09'.5	11'.8	22'.3	1'.5	
Suhail	222° 51'.8	43° 29'.3 S	90° 55'.3	22'.4	266° 40'.3	11'.9	20'.8	1'.6	
Vega	80° 39'.1	38° 48'.0 N	105° 55'.0	22'.5	281° 11'.2	11'.9	19'.2	1'.7	
Zuben'ubi	137° 05'.3	16° 05'.8 S	120° 54'.6	22'.6	295° 42'.1	11'.8	17'.5	1'.8	
	SHA	Mer.Pass.	135° 54'.3	22'.7	310° 12'.9	12'.0	15'.7	1'.9	
Venus	59° 22'.7	14:21	150° 54'.0	22'.7	324° 43'.9	11'.9	13'.8	2'.0	
Mars	175° 26'.1	06:38	165° 53'.7	22'.8	339° 14'.8	11'.9	11'.8	2'.0	
Jupiter	250° 20'.6	01:39							
Saturn	133° 03'.7	09:27	SD 16'.3	d 0'.1	SD 14'.9		14'.9	14'.8	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 15	Moonrise 16	Moonrise 17
N 72°	08:21	10:50	-	-	-	-
N 70°	08:02	09:49	-	12:03	12:16	13:04
68°	07:46	09:15	-	12:46	13:15	14:04
66°	07:33	08:50	10:29	13:15	13:49	14:39
64°	07:22	08:30	09:48	13:37	14:14	15:04
62°	07:12	08:14	09:20	13:55	14:34	15:23
60°	07:04	08:01	08:58	14:10	14:50	15:39
N 58°	06:57	07:49	08:41	14:22	15:03	15:53
56°	06:50	07:39	08:26	14:33	15:15	16:05
54°	06:44	07:30	08:14	14:43	15:25	16:15
52°	06:38	07:22	08:03	14:51	15:34	16:24
50°	06:33	07:14	07:53	14:59	15:43	16:32
45°	06:21	06:58	07:32	15:15	16:00	16:49
N 40°	06:11	06:45	07:15	15:29	16:14	17:03
35°	06:01	06:33	07:01	15:40	16:26	17:15
30°	05:53	06:23	06:49	15:50	16:37	17:26
20°	05:36	06:04	06:28	16:07	16:55	17:44
N 10°	05:20	05:46	06:09	16:23	17:11	17:59
0°	05:03	05:29	05:52	16:37	17:26	18:14
S 10°	04:44	05:11	05:34	16:51	17:40	18:29
20°	04:22	04:51	05:16	17:06	17:56	18:44
30°	03:53	04:26	04:54	17:24	18:15	19:02
35°	03:34	04:11	04:41	17:34	18:25	19:13
40°	03:11	03:53	04:26	17:46	18:37	19:25
45°	02:41	03:30	04:08	17:59	18:52	19:39
S 50°	01:56	03:01	03:45	18:16	19:09	19:56
52°	01:28	02:46	03:34	18:24	19:18	20:04
54°	00:43	02:28	03:22	18:33	19:27	20:14
56°	-	02:06	03:08	18:43	19:37	20:24
58°	-	01:37	02:51	18:54	19:49	20:35
S 60°	-	00:48	02:31	19:08	20:03	20:49
S 62°	-	-	02:05	19:23	20:20	21:05

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 15	Moonset 16	Moonset 17
N 72°	-	13:02	15:30	-	-	-
N 70°	-	14:02	15:50	08:39	10:08	11:01
68°	-	14:37	16:05	07:56	09:09	10:01
66°	13:22	15:02	16:18	07:28	08:35	09:26
64°	14:04	15:21	16:29	07:06	08:10	09:01
62°	14:32	15:37	16:39	06:49	07:50	08:41
60°	14:53	15:51	16:47	06:34	07:34	08:25
N 58°	15:10	16:02	16:55	06:22	07:21	08:12
56°	15:25	16:12	17:02	06:11	07:09	08:00
54°	15:38	16:21	17:08	06:02	06:59	07:50
52°	15:49	16:30	17:13	05:54	06:50	07:40
50°	15:59	16:37	17:19	05:46	06:42	07:32
45°	16:19	16:53	17:30	05:30	06:25	07:15
N 40°	16:36	17:07	17:41	05:17	06:11	07:01
35°	16:50	17:18	17:50	05:06	05:59	06:49
30°	17:02	17:29	17:59	04:56	05:48	06:38
20°	17:24	17:48	18:15	04:40	05:31	06:20
N 10°	17:42	18:05	18:31	04:25	05:15	06:04
0°	17:59	18:22	18:48	04:11	05:00	05:49
S 10°	18:17	18:40	19:07	03:58	04:46	05:34
20°	18:36	19:00	19:30	03:43	04:30	05:18
30°	18:58	19:25	19:59	03:27	04:12	05:00
35°	19:11	19:41	20:17	03:17	04:02	04:49
40°	19:26	19:59	20:40	03:06	03:50	04:37
45°	19:44	20:21	21:11	02:53	03:36	04:23
S 50°	20:06	20:51	21:56	02:37	03:19	04:05
52°	20:17	21:06	22:24	02:30	03:10	03:57
54°	20:29	21:24	23:09	02:22	03:02	03:48
56°	20:44	21:46	-	02:13	02:51	03:37
58°	21:00	22:16	-	02:02	02:40	03:25
S 60°	21:21	23:05	-	01:51	02:27	03:11
S 62°	21:47	-	-	01:37	02:11	02:55

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
15	5 02	4 47	11:55	22:49	10:24	12d 97%
16	4 33	4 18	11:56	23:37	11:13	13d 99%
17	4 04	3 49	11:56	24:26	12:02	14d Full

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2013 December 18, 19, 20 (Wed, Thur, Fri)

GMT	ARIES	VENUS -4.6		MARS +1.0		JUPITER -2.7		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
18 Wednesday 00	86° 46'.3	145° 49'.7	21° 04'.0 S	261° 17'.8	0° 10'.2 S	337° 21'.8	22° 19'.6 N	219° 37'.4	15° 24'.2 S
01	101° 48'.8	160° 51'.8	03'.4	276° 19'.1	10'.6	352° 24'.6	19'.7	234° 39'.7	24'.3
02	116° 51'.2	175° 54'.0	02'.9	291° 20'.5	11'.1	7° 27'.3	19'.7	249° 41'.9	24'.3
03	131° 53'.7	190° 56'.2	02'.3	306° 21'.8	11'.6	22° 30'.1	19'.8	264° 44'.1	24'.4
04	146° 56'.2	205° 58'.3	01'.8	321° 23'.1	12'.0	37° 32'.9	19'.8	279° 46'.3	24'.5
05	161° 58'.6	221° 00'.5	01'.2	336° 24'.4	12'.5	52° 35'.7	19'.8	294° 48'.5	24'.5
06	177° 01'.1	236° 02'.7	00'.7	351° 25'.8	12'.9	67° 38'.5	19'.9	309° 50'.7	24'.6
07	192° 03'.6	251° 04'.9	00'.1	6° 27'.1	13'.4	82° 41'.2	19'.9	324° 52'.9	24'.7
08	207° 06'.0	266° 07'.1	20° 59'.6 S	21° 28'.4	13'.8	97° 44'.0	20'.0	339° 55'.1	24'.7
09	222° 08'.5	281° 09'.3	59'.1	36° 29'.8	14'.3	112° 46'.8	20'.0	354° 57'.3	24'.8
10	237° 11'.0	296° 11'.5	58'.5	51° 31'.1	14'.8	127° 49'.6	20'.1	9° 59'.5	24'.8
11	252° 13'.4	311° 13'.7	58'.0	66° 32'.4	15'.2	142° 52'.4	20'.1	25° 01'.7	24'.9
12	267° 15'.9	326° 15'.9	20° 57'.4 S	81° 33'.8	0° 15'.7 S	157° 55'.1	22° 20'.2 N	40° 03'.9	15° 25'.0 S
13	282° 18'.3	341° 18'.2	56'.9	96° 35'.1	16'.1	172° 57'.9	20'.2	55° 06'.1	25'.0
14	297° 20'.8	356° 20'.4	56'.3	111° 36'.5	16'.6	188° 00'.7	20'.3	70° 08'.3	25'.1
15	312° 23'.3	11° 22'.6	55'.8	126° 37'.8	17'.1	203° 03'.5	20'.3	85° 10'.5	25'.2
16	327° 25'.7	26° 24'.8	55'.2	141° 39'.1	17'.5	218° 06'.3	20'.3	100° 12'.7	25'.2
17	342° 28'.2	41° 27'.1	54'.7	156° 40'.5	18'.0	233° 09'.0	20'.4	115° 14'.9	25'.3
18	357° 30'.7	56° 29'.3	54'.1	171° 41'.8	18'.4	248° 11'.8	20'.4	130° 17'.1	25'.4
19	12° 33'.1	71° 31'.6	53'.6	186° 43'.1	18'.9	263° 14'.6	20'.5	145° 19'.4	25'.4
20	27° 35'.6	86° 33'.8	53'.1	201° 44'.5	19'.3	278° 17'.4	20'.5	160° 21'.6	25'.5
21	42° 38'.1	101° 36'.1	52'.5	216° 45'.8	19'.8	293° 20'.2	20'.6	175° 23'.8	25'.6
22	57° 40'.5	116° 38'.3	52'.0	231° 47'.1	20'.3	308° 23'.0	20'.6	190° 26'.0	25'.6
23	72° 43'.0	131° 40'.6	51'.4	246° 48'.5	20'.7	323° 25'.7	20'.7	205° 28'.2	25'.7
19 Thursday 00	87° 45'.5	146° 42'.9	20° 50'.9 S	261° 49'.8	0° 21'.2 S	338° 28'.5	22° 20'.7 N	220° 30'.4	15° 25'.8 S
01	102° 47'.9	161° 45'.1	50'.3	276° 51'.1	21'.6	353° 31'.3	20'.7	235° 32'.6	25'.8
02	117° 50'.4	176° 47'.4	49'.8	291° 52'.5	22'.1	8° 34'.1	20'.8	250° 34'.8	25'.9
03	132° 52'.8	191° 49'.7	49'.2	306° 53'.8	22'.5	23° 36'.9	20'.8	265° 37'.0	26'.0
04	147° 55'.3	206° 52'.0	48'.7	321° 55'.2	23'.0	38° 39'.7	20'.9	280° 39'.2	26'.0
05	162° 57'.8	221° 54'.3	48'.1	336° 56'.5	23'.5	53° 42'.4	20'.9	295° 41'.4	26'.1
06	178° 00'.2	236° 56'.6	47'.6	351° 57'.8	23'.9	68° 45'.2	21'.0	310° 43'.6	26'.2
07	193° 02'.7	251° 58'.9	47'.1	6° 59'.2	24'.4	83° 48'.0	21'.0	325° 45'.8	26'.2
08	208° 05'.2	267° 01'.2	46'.5	22° 00'.5	24'.8	98° 50'.8	21'.1	340° 48'.0	26'.3
09	223° 07'.6	282° 03'.5	46'.0	37° 01'.9	25'.3	113° 53'.6	21'.1	355° 50'.2	26'.4
10	238° 10'.1	297° 05'.8	45'.4	52° 03'.2	25'.7	128° 56'.4	21'.2	10° 52'.5	26'.4
11	253° 12'.6	312° 08'.1	44'.9	67° 04'.5	26'.2	143° 59'.2	21'.2	25° 54'.7	26'.5
12	268° 15'.0	327° 10'.4	20° 44'.3 S	82° 05'.9	0° 26'.6 S	159° 01'.9	22° 21'.2 N	40° 56'.9	15° 26'.5 S
13	283° 17'.5	342° 12'.7	43'.8	97° 07'.2	27'.1	174° 04'.7	21'.3	55° 59'.1	26'.6
14	298° 20'.0	357° 15'.1	43'.3	112° 08'.6	27'.6	189° 07'.5	21'.3	71° 01'.3	26'.7
15	313° 22'.4	12° 17'.4	42'.7	127° 09'.9	28'.0	204° 10'.3	21'.4	86° 03'.5	26'.7
16	328° 24'.9	27° 19'.7	42'.2	142° 11'.2	28'.5	219° 13'.1	21'.4	101° 05'.7	26'.8
17	343° 27'.3	42° 22'.1	41'.6	157° 12'.6	28'.9	234° 15'.9	21'.5	116° 07'.9	26'.9
18	358° 29'.8	57° 24'.4	41'.1	172° 13'.9	29'.4	249° 18'.7	21'.5	131° 10'.1	26'.9
19	13° 32'.3	72° 26'.8	40'.5	187° 15'.3	29'.8	264° 21'.4	21'.6	146° 12'.3	27'.0
20	28° 34'.7	87° 29'.1	40'.0	202° 16'.6	30'.3	279° 24'.2	21'.6	161° 14'.5	27'.1
21	43° 37'.2	102° 31'.5	39'.5	217° 18'.0	30'.7	294° 27'.0	21'.7	176° 16'.7	27'.1
22	58° 39'.7	117° 33'.9	38'.9	232° 19'.3	31'.2	309° 29'.8	21'.7	191° 18'.9	27'.2
23	73° 42'.1	132° 36'.2	38'.4	247° 20'.6	31'.6	324° 32'.6	21'.7	206° 21'.2	27'.3
20 Friday 00	88° 44'.6	147° 38'.6	20° 37'.8 S	262° 22'.0	0° 32'.1 S	339° 35'.4	22° 21'.8 N	221° 23'.4	15° 27'.3 S
01	103° 47'.1	162° 41'.0	37'.3	277° 23'.3	32'.5	354° 38'.2	21'.8	236° 25'.6	27'.4
02	118° 49'.5	177° 43'.4	36'.8	292° 24'.7	33'.0	9° 41'.0	21'.9	251° 27'.8	27'.5
03	133° 52'.0	192° 45'.7	36'.2	307° 26'.0	33'.5	24° 43'.7	21'.9	266° 30'.0	27'.5
04	148° 54'.5	207° 48'.1	35'.7	322° 27'.4	33'.9	39° 46'.5	22'.0	281° 32'.2	27'.6
05	163° 56'.9	222° 50'.5	35'.1	337° 28'.7	34'.4	54° 49'.3	22'.0	296° 34'.4	27'.7
06	178° 59'.4	237° 52'.9	34'.6	352° 30'.1	34'.8	69° 52'.1	22'.1	311° 36'.6	27'.7
07	194° 01'.8	252° 55'.3	34'.0	7° 31'.4	35'.3	84° 54'.9	22'.1	326° 38'.8	27'.8
08	209° 04'.3	267° 57'.7	33'.5	22° 32'.7	35'.7	99° 57'.7	22'.2	341° 41'.0	27'.8
09	224° 06'.8	283° 00'.2	33'.0	37° 34'.1	36'.2	115° 00'.5	22'.2	356° 43'.2	27'.9
10	239° 09'.2	298° 02'.6	32'.4	52° 35'.4	36'.6	130° 03'.3	22'.2	11° 45'.4	28'.0
11	254° 11'.7	313° 05'.0	31'.9	67° 36'.8	37'.1	145° 06'.1	22'.3	26° 47'.7	28'.0
12	269° 14'.2	328° 07'.4	20° 31'.3 S	82° 38'.1	0° 37'.5 S	160° 08'.9	22° 22'.3 N	41° 49'.9	15° 28'.1 S
13	284° 16'.6	343° 09'.9	30'.8	97° 39'.5	38'.0	175° 11'.6	22'.4	56° 52'.1	28'.2
14	299° 19'.1	358° 12'.3	30'.3	112° 40'.8	38'.4	190° 14'.4	22'.4	71° 54'.3	28'.2
15	314° 21'.6	13° 14'.7	29'.7	127° 42'.2	38'.9	205° 17'.2	22'.5	86° 56'.5	28'.3
16	329° 24'.0	28° 17'.2	29'.2	142° 43'.5	39'.3	220° 20'.0	22'.5	101° 58'.7	28'.4
17	344° 26'.5	43° 19'.6	28'.7	157° 44'.9	39'.8	235° 22'.8	22'.6	117° 00'.9	28'.4
18	359° 28'.9	58° 22'.1	28'.1	172° 46'.2	40'.2	250° 25'.6	22'.6	132° 03'.1	28'.5
19	14° 31'.4	73° 24'.5	27'.6	187° 47'.6	40'.7	265° 28'.4	22'.7	147° 05'.3	28'.5
20	29° 33'.9	88° 27'.0	27'.0	202° 48'.9	41'.1	280° 31'.2	22'.7	162° 07'.5	28'.6
21	44° 36'.3	103° 29'.5	26'.5	217° 50'.3	41'.6	295° 34'.0	22'.8	177° 09'.8	28'.7
22	59° 38'.8	118° 32'.0	26'.0	232° 51'.6	42'.0	310° 36'.8	22'.8	192° 12'.0	28'.7
23	74° 41'.3	133° 34'.4	25'.4	247° 53'.0	42'.5	325° 39'.6	22'.8	207° 14'.2	28'.8
	M.P. 18:06	v 2'.3	d 0'.5	v 1'.3	d 0'.5	v 2'.8	d 0'.0	v 2'.2	d 0'.1

Name	SHA	Dec
Acamar	315° 17'.8	40° 15'.2 S
Achernar	335° 26'.3	57° 10'.2 S
Acrux	173° 08'.9	63° 10'.3 S
Adhara	255° 11'.9	28° 59'.6 S
Aldebaran	290° 48'.6	16° 32'.1 N
Alioth	166° 20'.6	55° 52'.7 N
Alkaid	152° 58'.9	49° 14'.4 N
Alnair	27° 43'.6	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.8 S
Alphard	217° 55'.5	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.1 N
Alpheratz	357° 43'.1	29° 10'.3 N
Altair	62° 08'.2	8° 54'.5 N
Ankaa	353° 15'.3	42° 14'.0 S
Antares	112° 26'.2	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.5 N
Atria	107° 28'.2	69° 02'.9 S
Avior	234° 17'.3	59° 33'.2 S
Bellatrix	278° 31'.3	6° 21'.6 N
Betelgeuse	271° 00'.6	7° 24'.4 N
Canopus	263° 55'.4	52° 42'.3 S
Capella	280° 33'.4	46° 00'.6 N
Deneb	49° 31'.5	45° 20'.2 N
Denebola	182° 33'.3	14° 29'.5 N
Diphda	348° 55'.5	17° 54'.7 S
Dubhe	193° 51'.2	61° 40'.1 N
Elnath	278° 11'.8	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.4 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.7	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.2 S
Gienah	175° 51'.9	17° 37'.1 S
Hadar	148° 47'.7	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.8	34° 22'.5 S
Kochab	137° 21'.1	74° 05'.7 N
Markab	13° 38'.0	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.3	36° 26'.1 S
Miaplacidus	221° 38'.8	69° 46'.4 S
Mirfak	308° 39'.3	49° 54'.7 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.4 S
Polaris	317° 14'.3	89° 19'.6 N
Pollux	243° 27'.0	27° 59'.3 N
Procyon	244° 59'.1	5° 11'.1 N
Rasalhague	96° 06'.5	12° 33'.2 N
Regulus	207° 43'.0	11° 53'.7 N
Rigel	281° 11'.4	8° 11'.3 S
Rigil Kent	139° 51'.6	60° 53'.2 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.9	56° 37'.2 N
Shaula	96° 21'.8	37° 06'.6 S
Sirius	258° 33'.0	16° 44'.3 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 51'.8	43° 29'.3 S
Vega	80° 39'.1	38° 48'.0 N
Zuben'ubi	137° 05'.3	16° 05'.8 S

	SHA	Mer.Pass.
Venus	58° 57'.4	14:11
Mars	174° 04'.4	06:32
Jupiter	250° 43'.1	01:26
Saturn	132° 44'.9	09:17

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
18 00	180° 53'.4	23° 22'.9 S	353° 45'.7	12'.0	19° 09'.8 N	2'.2	54'.2
01	195° 53'.1	23'.0	8° 16'.7	12'.0	07'.6	2'.2	
02	210° 52'.8	23'.0	22° 47'.7	12'.0	05'.4	2'.3	54'.1
03	225° 52'.5	23'.1	37° 18'.7	12'.1	03'.1	2'.4	
04	240° 52'.2	23'.2	51° 49'.8	12'.1	00'.7	2'.5	
05	255° 51'.9	23'.2	66° 20'.9	12'.1	18° 58'.2 N	2'.6	
06	270° 51'.6	23'.3	80° 52'.0	12'.1	55'.6	2'.7	
07	285° 51'.3	23'.4	95° 23'.1	12'.1	52'.9	2'.7	
08	300° 51'.0	23'.4	109° 54'.2	12'.2	50'.2	2'.9	
09	315° 50'.7	23'.5	124° 25'.4	12'.2	47'.3	2'.9	
10	330° 50'.4	23'.6	138° 56'.6	12'.2	44'.4	3'.0	
11	345° 50'.1	23'.6	153° 27'.8	12'.3	41'.4	3'.1	
12	0° 49'.7	23° 23'.7 S	167° 59'.1	12'.3	18° 38'.3 N	3'.2	54'.1
13	15° 49'.4	23'.8	182° 30'.4	12'.3	35'.1	3'.3	
14	30° 49'.1	23'.8	197° 01'.7	12'.3	31'.8	3'.3	
15	45° 48'.8	23'.9	211° 33'.0	12'.4	28'.5	3'.4	
16	60° 48'.5	23'.9	226° 04'.4	12'.4	25'.1	3'.6	
17	75° 48'.2	24'.0	240° 35'.8	12'.4	21'.5	3'.6	
18	90° 47'.9	24'.1	255° 07'.2	12'.4	17'.9	3'.6	54'.0
19	105° 47'.6	24'.1	269° 38'.6	12'.5	14'.3	3'.8	
20	120° 47'.3	24'.2	284° 10'.1	12'.5	10'.5	3'.9	
21	135° 47'.0	24'.2	298° 41'.6	12'.6	06'.6	3'.9	
22	150° 46'.7	24'.3	313° 13'.2	12'.5	02'.7	4'.0	
23	165° 46'.4	24'.3	327° 44'.7	12'.6	17° 58'.7 N	4'.1	
19 00	180° 46'.1	23° 24'.4 S	342° 16'.3	12'.7	17° 54'.6 N	4'.1	54'.0
01	195° 45'.8	24'.4	356° 48'.0	12'.6	50'.5	4'.3	
02	210° 45'.4	24'.5	11° 19'.6	12'.7	46'.2	4'.3	
03	225° 45'.1	24'.5	25° 51'.3	12'.7	41'.9	4'.4	
04	240° 44'.8	24'.6	40° 23'.0	12'.8	37'.5	4'.5	
05	255° 44'.5	24'.6	54° 54'.8	12'.8	33'.0	4'.6	
06	270° 44'.2	24'.7	69° 26'.6	12'.8	28'.4	4'.6	
07	285° 43'.9	24'.7	83° 58'.4	12'.8	23'.8	4'.7	
08	300° 43'.6	24'.8	98° 30'.2	12'.9	19'.1	4'.8	
09	315° 43'.3	24'.8	113° 02'.1	12'.9	14'.3	4'.9	
10	330° 43'.0	24'.9	127° 34'.0	13'.0	09'.4	4'.9	
11	345° 42'.7	24'.9	142° 06'.0	12'.9	04'.5	5'.0	
12	0° 42'.4	23° 25'.0 S	156° 37'.9	13'.0	16° 59'.5 N	5'.1	54'.0
13	15° 42'.1	25'.0	171° 09'.9	13'.1	54'.4	5'.2	
14	30° 41'.7	25'.1	185° 42'.0	13'.0	49'.2	5'.2	
15	45° 41'.4	25'.1	200° 14'.0	13'.1	44'.0	5'.3	
16	60° 41'.1	25'.1	214° 46'.1	13'.2	38'.7	5'.4	
17	75° 40'.8	25'.2	229° 18'.3	13'.1	33'.3	5'.5	
18	90° 40'.5	25'.2	243° 50'.4	13'.2	27'.8	5'.5	
19	105° 40'.2	25'.3	258° 22'.6	13'.2	22'.3	5'.6	
20	120° 39'.9	25'.3	272° 54'.8	13'.3	16'.7	5'.7	
21	135° 39'.6	25'.3	287° 27'.1	13'.3	11'.0	5'.7	
22	150° 39'.3	25'.4	301° 59'.4	13'.3	05'.3	5'.8	
23	165° 39'.0	25'.4	316° 31'.7	13'.4	15° 59'.5 N	5'.9	
20 00	180° 38'.7	23° 25'.4 S	331° 04'.1	13'.3	15° 53'.6 N	5'.9	54'.0
01	195° 38'.4	25'.5	345° 36'.4	13'.5	47'.7	6'.0	
02	210° 38'.0	25'.5	0° 08'.9	13'.4	41'.7	6'.1	
03	225° 37'.7	25'.5	14° 41'.3	13'.5	35'.6	6'.2	
04	240° 37'.4	25'.6	29° 13'.8	13'.5	29'.4	6'.2	
05	255° 37'.1	25'.6	43° 46'.3	13'.5	23'.2	6'.3	
06	270° 36'.8	25'.6	58° 18'.8	13'.6	16'.9	6'.3	
07	285° 36'.5	25'.6	72° 51'.4	13'.6	10'.6	6'.4	
08	300° 36'.2	25'.7	87° 24'.0	13'.7	04'.2	6'.5	
09	315° 35'.9	25'.7	101° 56'.7	13'.6	14° 57'.7 N	6'.6	
10	330° 35'.6	25'.7	116° 29'.3	13'.7	51'.1	6'.6	
11	345° 35'.3	25'.8	131° 02'.0	13'.8	44'.5	6'.6	
12	0° 35'.0	23° 25'.8 S	145° 34'.8	13'.7	14° 37'.9 N	6'.8	54'.0
13	15° 34'.6	25'.8	160° 07'.5	13'.8	31'.1	6'.7	
14	30° 34'.3	25'.8	174° 40'.3	13'.8	24'.4	6'.9	
15	45° 34'.0	25'.8	189° 13'.1	13'.9	17'.5	6'.9	
16	60° 33'.7	25'.9	203° 46'.0	13'.8	10'.6	7'.0	
17	75° 33'.4	25'.9	218° 18'.8	13'.9	03'.6	7'.0	
18	90° 33'.1	25'.9	232° 51'.7	14'.0	13° 56'.6 N	7'.1	
19	105° 32'.8	25'.9	247° 24'.7	13'.9	49'.5	7'.2	
20	120° 32'.5	25'.9	261° 57'.6	14'.0	42'.3	7'.2	
21	135° 32'.2	26'.0	276° 30'.6	14'.0	35'.1	7'.2	
22	150° 31'.9	26'.0	291° 03'.6	14'.1	27'.9	7'.4	
23	165° 31'.6	26'.0	305° 36'.7	14'.1	20'.5	7'.4	
	SD 16'.3	d 0'.0	SD 14'.7		14'.7	14'.7	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 18	Moonrise 19	Moonrise 20
N 72°	08:24	10:56	-	-	15:12	17:07
N 70°	08:04	09:53	-	14:28	16:02	17:37
68°	07:48	09:18	-	15:13	16:33	17:58
66°	07:35	08:52	10:33	15:43	16:56	18:15
64°	07:24	08:33	09:51	16:05	17:14	18:29
62°	07:15	08:17	09:22	16:23	17:29	18:40
60°	07:06	08:03	09:01	16:37	17:42	18:50
N 58°	06:59	07:51	08:43	16:50	17:52	18:58
56°	06:52	07:41	08:29	17:01	18:01	19:06
54°	06:46	07:32	08:16	17:10	18:10	19:12
52°	06:40	07:24	08:05	17:18	18:17	19:18
50°	06:35	07:16	07:55	17:26	18:24	19:24
45°	06:23	07:00	07:34	17:42	18:38	19:35
N 40°	06:13	06:47	07:17	17:55	18:50	19:45
35°	06:03	06:35	07:03	18:07	18:59	19:53
30°	05:54	06:24	06:51	18:16	19:08	20:00
20°	05:38	06:05	06:29	18:33	19:23	20:13
N 10°	05:22	05:48	06:11	18:48	19:36	20:23
0°	05:05	05:31	05:53	19:02	19:48	20:34
S 10°	04:46	05:13	05:36	19:16	20:01	20:44
20°	04:23	04:52	05:17	19:30	20:14	20:54
30°	03:54	04:27	04:55	19:47	20:28	21:07
35°	03:35	04:12	04:42	19:57	20:37	21:14
40°	03:12	03:54	04:27	20:08	20:47	21:22
45°	02:41	03:31	04:09	20:21	20:58	21:31
S 50°	01:56	03:01	03:46	20:37	21:12	21:42
52°	01:28	02:46	03:35	20:44	21:18	21:48
54°	00:41	02:28	03:23	20:53	21:26	21:53
56°	-	02:06	03:09	21:02	21:34	22:00
58°	-	01:36	02:52	21:13	21:42	22:07
S 60°	-	00:46	02:31	21:25	21:53	22:15
S 62°	-	-	02:05	21:39	22:04	22:24

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 18	Moonset 19	Moonset 20
N 72°	-	12:59	15:30	-	12:10	11:50
N 70°	-	14:01	15:50	11:17	11:20	11:20
68°	-	14:37	16:06	10:31	10:48	10:57
66°	13:21	15:02	16:19	10:01	10:24	10:39
64°	14:04	15:22	16:30	09:39	10:06	10:25
62°	14:32	15:38	16:40	09:21	09:51	10:13
60°	14:54	15:51	16:48	09:06	09:38	10:03
N 58°	15:11	16:03	16:56	08:53	09:27	09:54
56°	15:26	16:13	17:02	08:42	09:17	09:46
54°	15:38	16:22	17:09	08:33	09:08	09:39
52°	15:50	16:31	17:14	08:24	09:01	09:32
50°	15:59	16:38	17:20	08:16	08:54	09:26
45°	16:20	16:54	17:31	08:00	08:39	09:14
N 40°	16:37	17:08	17:42	07:46	08:27	09:04
35°	16:51	17:19	17:51	07:34	08:16	08:55
30°	17:04	17:30	18:00	07:24	08:07	08:47
20°	17:25	17:49	18:16	07:07	07:51	08:33
N 10°	17:43	18:06	18:33	06:52	07:38	08:22
0°	18:01	18:23	18:50	06:37	07:25	08:10
S 10°	18:19	18:42	19:09	06:23	07:11	07:59
20°	18:38	19:02	19:31	06:08	06:57	07:47
30°	19:00	19:27	20:00	05:50	06:41	07:33
35°	19:13	19:42	20:19	05:40	06:32	07:25
40°	19:28	20:01	20:42	05:28	06:21	07:16
45°	19:46	20:23	21:13	05:14	06:09	07:05
S 50°	20:08	20:53	21:59	04:57	05:53	06:52
52°	20:19	21:08	22:27	04:49	05:46	06:46
54°	20:32	21:26	23:14	04:40	05:38	06:39
56°	20:46	21:48	-	04:30	05:29	06:32
58°	21:03	22:18	-	04:19	05:19	06:23
S 60°	21:23	23:09	-	04:05	05:07	06:14
S 62°	21:50	-	-	03:50	04:53	06:02

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
18	3 34	3 20	11:57	00:26	12:50	15d 99%
19	3 05	2 50	11:57	01:13	13:36	16d 96%
20	2 35	2 20	11:58	01:59	14:22	17d 91%

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2013 December 21, 22, 23 (Sat, Sun, Mon)

GMT	ARIES	VENUS -4.6		MARS +1.0		JUPITER -2.7		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
21 00	89° 43'.7	148° 36'.9	20° 24'.9 S	262° 54'.3	0° 42'.9 S	340° 42'.3	22° 22'.9 N	222° 16'.4	15° 28'.9 S
01	104° 46'.2	163° 39'.4	24'.3	277° 55'.7	43'.4	355° 45'.1	22'.9	237° 18'.6	28'.9
02	119° 48'.7	178° 41'.9	23'.8	292° 57'.0	43'.8	10° 47'.9	23'.0	252° 20'.8	29'.0
03	134° 51'.1	193° 44'.4	23'.3	307° 58'.4	44'.3	25° 50'.7	23'.0	267° 23'.0	29'.1
Saturday 04	149° 53'.6	208° 46'.9	22'.7	322° 59'.7	44'.7	40° 53'.5	23'.1	282° 25'.2	29'.1
05	164° 56'.1	223° 49'.4	22'.2	338° 01'.1	45'.2	55° 56'.3	23'.1	297° 27'.4	29'.2
06	179° 58'.5	238° 51'.9	21'.7	353° 02'.4	45'.6	70° 59'.1	23'.2	312° 29'.7	29'.3
07	195° 01'.0	253° 54'.4	21'.1	8° 03'.8	46'.1	86° 01'.9	23'.2	327° 31'.9	29'.3
08	210° 03'.4	268° 56'.9	20'.6	23° 05'.1	46'.5	101° 04'.7	23'.3	342° 34'.1	29'.4
09	225° 05'.9	283° 59'.5	20'.1	38° 06'.5	47'.0	116° 07'.5	23'.3	357° 36'.3	29'.4
10	240° 08'.4	299° 02'.0	19'.5	53° 07'.8	47'.4	131° 10'.3	23'.3	12° 38'.5	29'.5
11	255° 10'.8	314° 04'.5	19'.0	68° 09'.2	47'.9	146° 13'.1	23'.4	27° 40'.7	29'.6
12	270° 13'.3	329° 07'.0	20° 18'.4 S	83° 10'.5	0° 48'.3 S	161° 15'.9	22° 23'.4 N	42° 42'.9	15° 29'.6 S
13	285° 15'.8	344° 09'.6	17'.9	98° 11'.9	48'.8	176° 18'.7	23'.5	57° 45'.1	29'.7
14	300° 18'.2	359° 12'.1	17'.4	113° 13'.2	49'.2	191° 21'.5	23'.5	72° 47'.3	29'.8
15	315° 20'.7	14° 14'.7	16'.8	128° 14'.6	49'.7	206° 24'.2	23'.6	87° 49'.6	29'.8
16	330° 23'.2	29° 17'.2	16'.3	143° 15'.9	50'.1	221° 27'.0	23'.6	102° 51'.8	29'.9
17	345° 25'.6	44° 19'.8	15'.8	158° 17'.3	50'.6	236° 29'.8	23'.7	117° 54'.0	29'.9
18	0° 28'.1	59° 22'.4	15'.2	173° 18'.7	51'.0	251° 32'.6	23'.7	132° 56'.2	30'.0
19	15° 30'.6	74° 24'.9	14'.7	188° 20'.0	51'.5	266° 35'.4	23'.8	147° 58'.4	30'.1
20	30° 33'.0	89° 27'.5	14'.2	203° 21'.4	51'.9	281° 38'.2	23'.8	163° 00'.6	30'.1
21	45° 35'.5	104° 30'.1	13'.6	218° 22'.7	52'.3	296° 41'.0	23'.9	178° 02'.8	30'.2
22	60° 37'.9	119° 32'.7	13'.1	233° 24'.1	52'.8	311° 43'.8	23'.9	193° 05'.0	30'.3
23	75° 40'.4	134° 35'.2	12'.6	248° 25'.4	53'.2	326° 46'.6	23'.9	208° 07'.3	30'.3
22 00	90° 42'.9	149° 37'.8	20° 12'.0 S	263° 26'.8	0° 53'.7 S	341° 49'.4	22° 24'.0 N	223° 09'.5	15° 30'.4 S
01	105° 45'.3	164° 40'.4	11'.5	278° 28'.1	54'.1	356° 52'.2	24'.0	238° 11'.7	30'.5
02	120° 47'.8	179° 43'.0	11'.0	293° 29'.5	54'.6	11° 55'.0	24'.1	253° 13'.9	30'.5
03	135° 50'.3	194° 45'.6	10'.4	308° 30'.9	55'.0	26° 57'.8	24'.1	268° 16'.1	30'.6
Sunday 04	150° 52'.7	209° 48'.2	09'.9	323° 32'.2	55'.5	42° 00'.6	24'.2	283° 18'.3	30'.6
05	165° 55'.2	224° 50'.9	09'.4	338° 33'.6	55'.9	57° 03'.4	24'.2	298° 20'.5	30'.7
06	180° 57'.7	239° 53'.5	08'.8	353° 34'.9	56'.4	72° 06'.2	24'.3	313° 22'.7	30'.8
07	196° 00'.1	254° 56'.1	08'.3	8° 36'.3	56'.8	87° 09'.0	24'.3	328° 25'.0	30'.8
08	211° 02'.6	269° 58'.7	07'.8	23° 37'.6	57'.3	102° 11'.8	24'.4	343° 27'.2	30'.9
09	226° 05'.0	285° 01'.4	07'.3	38° 39'.0	57'.7	117° 14'.6	24'.4	358° 29'.4	31'.0
10	241° 07'.5	300° 04'.0	06'.7	53° 40'.4	58'.1	132° 17'.4	24'.5	13° 31'.6	31'.0
11	256° 10'.0	315° 06'.6	06'.2	68° 41'.7	58'.6	147° 20'.2	24'.5	28° 33'.8	31'.1
12	271° 12'.4	330° 09'.3	20° 05'.7 S	83° 43'.1	0° 59'.0 S	162° 23'.0	22° 24'.5 N	43° 36'.0	15° 31'.1 S
13	286° 14'.9	345° 11'.9	05'.1	98° 44'.4	59'.5	177° 25'.8	24'.6	58° 38'.2	31'.2
14	301° 17'.4	0° 14'.6	04'.6	113° 45'.8	59'.9	192° 28'.6	24'.6	73° 40'.4	31'.3
15	316° 19'.8	15° 17'.2	04'.1	128° 47'.2	1° 00'.4 S	207° 31'.4	24'.7	88° 42'.7	31'.3
16	331° 22'.3	30° 19'.9	03'.5	143° 48'.5	00'.8	222° 34'.2	24'.7	103° 44'.9	31'.4
17	346° 24'.8	45° 22'.6	03'.0	158° 49'.9	01'.3	237° 37'.0	24'.8	118° 47'.1	31'.5
18	1° 27'.2	60° 25'.2	02'.5	173° 51'.3	01'.7	252° 39'.8	24'.8	133° 49'.3	31'.5
19	16° 29'.7	75° 27'.9	02'.0	188° 52'.6	02'.1	267° 42'.6	24'.9	148° 51'.5	31'.6
20	31° 32'.2	90° 30'.6	01'.4	203° 54'.0	02'.6	282° 45'.4	24'.9	163° 53'.7	31'.6
21	46° 34'.6	105° 33'.3	00'.9	218° 55'.3	03'.0	297° 48'.2	25'.0	178° 55'.9	31'.7
22	61° 37'.1	120° 36'.0	00'.4	233° 56'.7	03'.5	312° 51'.0	25'.0	193° 58'.2	31'.8
23	76° 39'.5	135° 38'.7	19° 59'.8 S	248° 58'.1	03'.9	327° 53'.8	25'.1	209° 00'.4	31'.8
23 00	91° 42'.0	150° 41'.4	19° 59'.3 S	263° 59'.4	1° 04'.4 S	342° 56'.6	22° 25'.1 N	224° 02'.6	15° 31'.9 S
01	106° 44'.5	165° 44'.1	58'.8	279° 00'.8	04'.8	357° 59'.4	25'.1	239° 04'.8	32'.0
02	121° 46'.9	180° 46'.8	58'.3	294° 02'.2	05'.2	13° 02'.2	25'.2	254° 07'.0	32'.0
03	136° 49'.4	195° 49'.5	57'.7	309° 03'.5	05'.7	28° 05'.0	25'.2	269° 09'.2	32'.1
Monday 04	151° 51'.9	210° 52'.2	57'.2	324° 04'.9	06'.1	43° 07'.8	25'.3	284° 11'.4	32'.1
05	166° 54'.3	225° 55'.0	56'.7	339° 06'.2	06'.6	58° 10'.6	25'.3	299° 13'.7	32'.2
06	181° 56'.8	240° 57'.7	56'.2	354° 07'.6	07'.0	73° 13'.4	25'.4	314° 15'.9	32'.3
07	196° 59'.3	256° 00'.4	55'.6	9° 09'.0	07'.5	88° 16'.2	25'.4	329° 18'.1	32'.3
08	212° 01'.7	271° 03'.2	55'.1	24° 10'.3	07'.9	103° 19'.0	25'.5	344° 20'.3	32'.4
09	227° 04'.2	286° 05'.9	54'.6	39° 11'.7	08'.3	118° 21'.8	25'.5	359° 22'.5	32'.4
10	242° 06'.7	301° 08'.6	54'.1	54° 13'.1	08'.8	133° 24'.6	25'.6	14° 24'.7	32'.5
11	257° 09'.1	316° 11'.4	53'.5	69° 14'.4	09'.2	148° 27'.4	25'.6	29° 27'.0	32'.6
12	272° 11'.6	331° 14'.1	19° 53'.0 S	84° 15'.8	1° 09'.7 S	163° 30'.2	22° 25'.7 N	44° 29'.2	15° 32'.6 S
13	287° 14'.0	346° 16'.9	52'.5	99° 17'.2	10'.1	178° 33'.0	25'.7	59° 31'.4	32'.7
14	302° 16'.5	1° 19'.7	52'.0	114° 18'.5	10'.5	193° 35'.8	25'.7	74° 33'.6	32'.8
15	317° 19'.0	16° 22'.4	51'.4	129° 19'.9	11'.0	208° 38'.6	25'.8	89° 35'.8	32'.8
16	332° 21'.4	31° 25'.2	50'.9	144° 21'.3	11'.4	223° 41'.4	25'.8	104° 38'.0	32'.9
17	347° 23'.9	46° 28'.0	50'.4	159° 22'.6	11'.9	238° 44'.2	25'.9	119° 40'.2	32'.9
18	2° 26'.4	61° 30'.8	49'.9	174° 24'.0	12'.3	253° 47'.0	25'.9	134° 42'.5	33'.0
19	17° 28'.8	76° 33'.6	49'.3	189° 25'.4	12'.7	268° 49'.8	26'.0	149° 44'.7	33'.1
20	32° 31'.3	91° 36'.4	48'.8	204° 26'.7	13'.2	283° 52'.6	26'.0	164° 46'.9	33'.1
21	47° 33'.8	106° 39'.2	48'.3	219° 28'.1	13'.6	298° 55'.4	26'.1	179° 49'.1	33'.2
22	62° 36'.2	121° 42'.0	47'.8	234° 29'.5	14'.1	313° 58'.2	26'.1	194° 51'.3	33'.3
23	77° 38'.7	136° 44'.8	47'.3	249° 30'.9	14'.5	329° 01'.0	26'.2	209° 53'.5	33'.3
	M.P. 17:54	v 2'.6	d 0'.5	v 1'.4	d 0'.4	v 2'.8	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 15'.2 S
Achernar	335° 26'.3	57° 10'.2 S
Acrux	173° 08'.9	63° 10'.3 S
Adhara	255° 11'.8	28° 59'.6 S
Aldebaran	290° 48'.6	16° 32'.1 N
Alioth	166° 20'.6	55° 52'.7 N
Alkaid	152° 58'.9	49° 14'.4 N
Alnair	27° 43'.6	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.8 S
Alphard	217° 55'.5	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.1 N
Alpheratz	357° 43'.1	29° 10'.3 N
Altair	62° 08'.2	8° 54'.5 N
Ankaa	353° 15'.4	42° 14'.0 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.5 N
Atria	107° 28'.2	69° 02'.9 S
Avior	234° 17'.2	59° 33'.3 S
Bellatrix	278° 31'.3	6° 21'.6 N
Betelgeuse	271° 00'.6	7° 24'.4 N
Canopus	263° 55'.4	52° 42'.3 S
Capella	280° 33'.4	46° 00'.6 N
Deneb	49° 31'.6	45° 20'.1 N
Denebola	182° 33'.3	14° 29'.5 N
Diphda	348° 55'.5	17° 54'.7 S
Dubhe	193° 51'.2	61° 40'.1 N
Elnath	278° 11'.8	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.4 N
Enif	33° 46'.9	9° 56'.6 N
Fomalhaut	15° 23'.7	29° 32'.9 S
Gacrux	172° 00'.5	57° 11'.2 S
Gienah	175° 51'.9	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 21'.0	74° 05'.7 N
Markab	13° 38'.0	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.3	36° 26'.1 S
Miaplacidus	221° 38'.8	69° 46'.4 S
Mirfak	308° 39'.4	49° 54'.7 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.4 S
Polaris	317° 15'.2	89° 19'.6 N
Pollux	243° 27'.0	27° 59'.3 N
Procyon	244° 59'.0	5° 11'.1 N
Rasalhague	96° 06'.5	12° 33'.2 N
Regulus	207° 43'.0	11° 53'.7 N
Rigel	281° 11'.4	8° 11'.3 S
Rigil Kent	139° 51'.5	60° 53'.2 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.9	56° 37'.2 N
Shaula	96° 21'.8	37° 06'.6 S
Sirius	258° 33'.0	16° 44'.3 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 51'.8	43° 29'.3 S
Vega	80° 39'.1	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.8 S

	SHA	Mer.Pass.
Venus	58° 55'.0	13:59
Mars	172° 43'.9	06:26
Jupiter	251° 06'.5	01:12
Saturn	132° 26'.6	09:06

SUN		MOON				
GHA	Dec	GHA	v	Dec	d	HP
180° 31'.2	23° 26'.0 S	320° 09'.8	14'.1	13° 13'.1 N	7'.4	54'.0
195° 30'.9	26'.0	334° 42'.9	14'.1	05'.7	7'.5	
210° 30'.6	26'.0	349° 16'.0	14'.1	12° 58'.2 N	7'.5	
225° 30'.3	26'.0	3° 49'.1	14'.2	50'.7	7'.6	
240° 30'.0	26'.1	18° 22'.3	14'.2	43'.1	7'.7	54'.1
255° 29'.7	26'.1	32° 55'.5	14'.3	35'.4	7'.7	
270° 29'.4	26'.1	47° 28'.8	14'.2	27'.7	7'.8	
285° 29'.1	26'.1	62° 02'.0	14'.3	19'.9	7'.8	
300° 28'.8	26'.1	76° 35'.3	14'.3	12'.1	7'.9	
315° 28'.5	26'.1	91° 08'.6	14'.3	04'.2	7'.9	
330° 28'.1	26'.1	105° 41'.9	14'.4	11° 56'.3 N	8'.0	
345° 27'.8	26'.1	120° 15'.3	14'.4	48'.3	8'.0	
0° 27'.5	23° 26'.1 S	134° 48'.7	14'.4	11° 40'.3 N	8'.1	54'.1
15° 27'.2	26'.1	149° 22'.1	14'.4	32'.2	8'.1	
30° 26'.9	26'.1	163° 55'.5	14'.4	24'.1	8'.2	
45° 26'.6	26'.1	178° 28'.9	14'.5	15'.9	8'.2	
60° 26'.3	26'.1	193° 02'.4	14'.5	07'.7	8'.2	
75° 26'.0	26'.1	207° 35'.9	14'.5	10° 59'.5 N	8'.4	
90° 25'.7	26'.1	222° 09'.4	14'.5	51'.1	8'.3	54'.2
105° 25'.4	26'.1	236° 42'.9	14'.5	42'.8	8'.4	
120° 25'.0	26'.1	251° 16'.4	14'.6	34'.4	8'.5	
135° 24'.7	26'.1	265° 50'.0	14'.6	25'.9	8'.5	
150° 24'.4	26'.1	280° 23'.6	14'.6	17'.4	8'.5	
165° 24'.1	26'.1	294° 57'.2	14'.6	08'.9	8'.6	
180° 23'.8	23° 26'.1 S	309° 30'.8	14'.6	10° 00'.3 N	8'.6	54'.2
195° 23'.5	26'.1	324° 04'.4	14'.7	9° 51'.7 N	8'.7	
210° 23'.2	26'.1	338° 38'.1	14'.7	43'.0	8'.7	
225° 22'.9	26'.1	353° 11'.8	14'.7	34'.3	8'.8	
240° 22'.6	26'.1	7° 45'.5	14'.7	25'.5	8'.8	54'.3
255° 22'.3	26'.1	22° 19'.2	14'.7	16'.7	8'.8	
270° 21'.9	26'.1	36° 52'.9	14'.7	07'.9	8'.9	
285° 21'.6	26'.0	51° 26'.6	14'.7	8° 59'.0 N	8'.9	
300° 21'.3	26'.0	66° 00'.3	14'.8	50'.1	9'.0	
315° 21'.0	26'.0	80° 34'.1	14'.7	41'.1	9'.0	
330° 20'.7	26'.0	95° 07'.8	14'.8	32'.1	9'.0	
345° 20'.4	26'.0	109° 41'.6	14'.8	23'.1	9'.1	
0° 20'.1	23° 26'.0 S	124° 15'.4	14'.8	8° 14'.0 N	9'.1	54'.4
15° 19'.8	26'.0	138° 49'.2	14'.8	04'.9	9'.2	
30° 19'.5	25'.9	153° 23'.0	14'.8	7° 55'.7 N	9'.2	
45° 19'.2	25'.9	167° 56'.8	14'.9	46'.5	9'.2	
60° 18'.8	25'.9	182° 30'.7	14'.8	37'.3	9'.3	
75° 18'.5	25'.9	197° 04'.5	14'.8	28'.0	9'.2	
90° 18'.2	25'.9	211° 38'.3	14'.9	18'.8	9'.4	
105° 17'.9	25'.9	226° 12'.2	14'.8	09'.4	9'.3	54'.5
120° 17'.6	25'.8	240° 46'.0	14'.9	00'.1	9'.4	
135° 17'.3	25'.8	255° 19'.9	14'.8	6° 50'.7 N	9'.5	
150° 17'.0	25'.8	269° 53'.7	14'.9	41'.2	9'.4	
165° 16'.7	25'.8	284° 27'.6	14'.9	31'.8	9'.5	
180° 16'.4	23° 25'.7 S	299° 01'.5	14'.9	6° 22'.3 N	9'.5	54'.5
195° 16'.0	25'.7	313° 35'.4	14'.8	12'.8	9'.6	
210° 15'.7	25'.7	328° 09'.2	14'.9	03'.2	9'.6	54'.6
225° 15'.4	25'.7	342° 43'.1	14'.9	5° 53'.6 N	9'.6	
240° 15'.1	25'.6	357° 17'.0	14'.9	44'.0	9'.6	
255° 14'.8	25'.6	11° 50'.9	14'.8	34'.4	9'.7	
270° 14'.5	25'.6	26° 24'.7	14'.9	24'.7	9'.7	
285° 14'.2	25'.5	40° 58'.6	14'.9	15'.0	9'.7	54'.7
300° 13'.9	25'.5	55° 32'.5	14'.9	05'.3	9'.7	
315° 13'.6	25'.5	70° 06'.4	14'.8	4° 55'.6 N	9'.8	
330° 13'.3	25'.4	84° 40'.2	14'.9	45'.8	9'.8	
345° 12'.9	25'.4	99° 14'.1	14'.8	36'.0	9'.9	
0° 12'.6	23° 25'.4 S	113° 47'.9	14'.9	4° 26'.1 N	9'.8	54'.7
15° 12'.3	25'.3	128° 21'.8	14'.8	16'.3	9'.9	54'.8
30° 12'.0	25'.3	142° 55'.6	14'.9	06'.4	9'.9	
45° 11'.7	25'.3	157° 29'.5	14'.8	3° 56'.5 N	9'.9	
60° 11'.4	25'.2	172° 03'.3	14'.8	46'.6	9'.9	
75° 11'.1	25'.2	186° 37'.1	14'.8	36'.7	10'.0	
90° 10'.8	25'.2	201° 10'.9	14'.8	26'.7	10'.0	54'.9
105° 10'.5	25'.1	215° 44'.7	14'.8	16'.7	10'.0	
120° 10'.1	25'.1	230° 18'.5	14'.8	06'.7	10'.0	
135° 09'.8	25'.0	244° 52'.3	14'.7	2° 56'.7 N	10'.1	
150° 09'.5	25'.0	259° 26'.0	14'.8	46'.6	10'.0	55'.0
165° 09'.2	24'.9	273° 59'.8	14'.7	36'.6	10'.1	
SD 16'.3	d 0'.0	SD	14'.7	14'.8	14'.9	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 21	Moonrise 22	Moonrise 23
N 72°	08:26	10:58	-	18:52	20:31	22:10
N 70°	08:06	09:55	-	19:10	20:42	22:14
68°	07:50	09:20	-	19:24	20:50	22:17
66°	07:37	08:54	10:35	19:35	20:57	22:19
64°	07:26	08:34	09:53	19:45	21:03	22:21
62°	07:16	08:18	09:24	19:53	21:08	22:23
60°	07:08	08:05	09:02	20:00	21:12	22:25
N 58°	07:00	07:53	08:45	20:06	21:16	22:26
56°	06:53	07:43	08:30	20:12	21:19	22:28
54°	06:47	07:34	08:17	20:17	21:22	22:29
52°	06:42	07:25	08:06	20:21	21:25	22:30
50°	06:36	07:18	07:56	20:25	21:28	22:31
45°	06:24	07:02	07:36	20:34	21:33	22:33
N 40°	06:14	06:48	07:19	20:41	21:37	22:35
35°	06:05	06:36	07:05	20:47	21:41	22:36
30°	05:56	06:26	06:52	20:52	21:45	22:38
20°	05:39	06:07	06:31	21:02	21:51	22:40
N 10°	05:23	05:50	06:12	21:10	21:56	22:42
0°	05:06	05:32	05:55	21:18	22:01	22:44
S 10°	04:47	05:14	05:37	21:25	22:06	22:46
20°	04:24	04:54	05:18	21:33	22:11	22:48
30°	03:55	04:29	04:56	21:43	22:17	22:50
35°	03:37	04:13	04:43	21:48	22:20	22:52
40°	03:13	03:55	04:28	21:54	22:24	22:53
45°	02:43	03:33	04:10	22:01	22:28	22:55
S 50°	01:57	03:03	03:47	22:09	22:34	22:57
52°	01:29	02:48	03:37	22:13	22:36	22:58
54°	00:42	02:30	03:24	22:17	22:39	22:59
56°	-	02:07	03:10	22:22	22:42	23:00
58°	-	01:37	02:53	22:27	22:45	23:02
S 60°	-	00:46	02:33	22:33	22:49	23:03
S 62°	-	-	02:06	22:40	22:53	23:05

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 21	Moonset 22	Moonset 23
N 72°	-	12:59	15:31	11:37	11:28	11:19
N 70°	-	14:02	15:51	11:18	11:16	11:13
68°	-	14:38	16:07	11:02	11:06	11:08
66°	13:22	15:03	16:20	10:50	10:58	11:04
64°	14:05	15:23	16:31	10:39	10:51	11:00
62°	14:33	15:39	16:41	10:30	10:45	10:57
60°	14:55	15:53	16:50	10:23	10:39	10:54
N 58°	15:12	16:04	16:57	10:16	10:35	10:52
56°	15:27	16:15	17:04	10:10	10:31	10:50
54°	15:40	16:24	17:10	10:04	10:27	10:48
52°	15:51	16:32	17:16	09:59	10:24	10:46
50°	16:01	16:39	17:21	09:55	10:20	10:44
45°	16:22	16:56	17:33	09:45	10:14	10:41
N 40°	16:39	17:09	17:43	09:37	10:08	10:38
35°	16:53	17:21	17:53	09:30	10:03	10:35
30°	17:05	17:32	18:01	09:24	09:59	10:33
20°	17:26	17:50	18:18	09:13	09:51	10:29
N 10°	17:45	18:08	18:34	09:04	09:45	10:25
0°	18:02	18:25	18:51	08:55	09:38	10:22
S 10°	18:20	18:43	19:10	08:46	09:32	10:18
20°	18:39	19:04	19:33	08:36	09:25	10:14
30°	19:01	19:29	20:02	08:25	09:18	10:10
35°	19:14	19:44	20:21	08:19	09:13	10:08
40°	19:29	20:02	20:44	08:12	09:08	10:05
45°	19:47	20:25	21:15	08:03	09:02	10:02
S 50°	20:10	20:55	22:00	07:53	08:55	09:58
52°	20:21	21:10	22:28	07:48	08:52	09:56
54°	20:33	21:28	23:15	07:43	08:48	09:54
56°	20:47	21:50	-	07:37	08:44	09:52
58°	21:04	22:20	-	07:31	08:39	09:49
S 60°	21:25	23:11	-	07:23	08:34	09:47
S 62°	21:51	-	-	07:15	08:29	09:44

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
21	2 06	1 51	11:58	02:44	15:06	18d 85%
22	1 36	1 21	11:59	03:28	15:50	19d 78%
23	1 06	0 51	11:59	04:11	16:33	20d 70%

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2013 December 24, 25, 26 (Tue, Wed, Thur)

GMT	ARIES	VENUS -4.5		MARS +0.9		JUPITER -2.7		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
24 Tuesday 00	92° 41'.1	151° 47'.6	19° 46'.7 S	264° 32'.2	1° 14'.9 S	344° 03'.8	22° 26'.2 N	224° 55'.8	15° 33'.4 S
01	107° 43'.6	166° 50'.4	46'.2	279° 33'.6	15'.4	359° 06'.6	26'.3	239° 58'.0	33'.4
02	122° 46'.1	181° 53'.2	45'.7	294° 35'.0	15'.8	14° 09'.4	26'.3	255° 00'.2	33'.5
03	137° 48'.5	196° 56'.0	45'.2	309° 36'.3	16'.3	29° 12'.2	26'.3	270° 02'.4	33'.6
04	152° 51'.0	211° 58'.9	44'.6	324° 37'.7	16'.7	44° 15'.0	26'.4	285° 04'.6	33'.6
05	167° 53'.5	227° 01'.7	44'.1	339° 39'.1	17'.1	59° 17'.8	26'.4	300° 06'.8	33'.7
06	182° 55'.9	242° 04'.5	43'.6	354° 40'.4	17'.6	74° 20'.7	26'.5	315° 09'.1	33'.7
07	197° 58'.4	257° 07'.4	43'.1	9° 41'.8	18'.0	89° 23'.5	26'.5	330° 11'.3	33'.8
08	213° 00'.9	272° 10'.2	42'.6	24° 43'.2	18'.5	104° 26'.3	26'.6	345° 13'.5	33'.9
09	228° 03'.3	287° 13'.1	42'.0	39° 44'.6	18'.9	119° 29'.1	26'.6	0° 15'.7	33'.9
10	243° 05'.8	302° 15'.9	41'.5	54° 45'.9	19'.3	134° 31'.9	26'.7	15° 17'.9	34'.0
11	258° 08'.3	317° 18'.8	41'.0	69° 47'.3	19'.8	149° 34'.7	26'.7	30° 20'.2	34'.0
12	273° 10'.7	332° 21'.7	19° 40'.5 S	84° 48'.7	1° 20'.2 S	164° 37'.5	22° 26'.8 N	45° 22'.4	15° 34'.1 S
13	288° 13'.2	347° 24'.5	40'.0	99° 50'.1	20'.6	179° 40'.3	26'.8	60° 24'.6	34'.2
14	303° 15'.6	2° 27'.4	39'.5	114° 51'.4	21'.1	194° 43'.1	26'.9	75° 26'.8	34'.2
15	318° 18'.1	17° 30'.3	38'.9	129° 52'.8	21'.5	209° 45'.9	26'.9	90° 29'.0	34'.3
16	333° 20'.6	32° 33'.2	38'.4	144° 54'.2	22'.0	224° 48'.7	27'.0	105° 31'.2	34'.3
17	348° 23'.0	47° 36'.1	37'.9	159° 55'.6	22'.4	239° 51'.5	27'.0	120° 33'.5	34'.4
18	3° 25'.5	62° 39'.0	37'.4	174° 56'.9	22'.8	254° 54'.3	27'.0	135° 35'.7	34'.5
19	18° 28'.0	77° 41'.8	36'.9	189° 58'.3	23'.3	269° 57'.1	27'.1	150° 37'.9	34'.5
20	33° 30'.4	92° 44'.8	36'.4	204° 59'.7	23'.7	284° 59'.9	27'.1	165° 40'.1	34'.6
21	48° 32'.9	107° 47'.7	35'.8	220° 01'.1	24'.1	300° 02'.7	27'.2	180° 42'.3	34'.7
22	63° 35'.4	122° 50'.6	35'.3	235° 02'.4	24'.6	315° 05'.6	27'.2	195° 44'.6	34'.7
23	78° 37'.8	137° 53'.5	34'.8	250° 03'.8	25'.0	330° 08'.4	27'.3	210° 46'.8	34'.8
25 Wednesday 00	93° 40'.3	152° 56'.4	19° 34'.3 S	265° 05'.2	1° 25'.4 S	345° 11'.2	22° 27'.3 N	225° 49'.0	15° 34'.8 S
01	108° 42'.8	167° 59'.3	33'.8	280° 06'.6	25'.9	0° 14'.0	27'.4	240° 51'.2	34'.9
02	123° 45'.2	183° 02'.3	33'.3	295° 07'.9	26'.3	15° 16'.8	27'.4	255° 53'.4	35'.0
03	138° 47'.7	198° 05'.2	32'.8	310° 09'.3	26'.7	30° 19'.6	27'.5	270° 55'.6	35'.0
04	153° 50'.1	213° 08'.1	32'.2	325° 10'.7	27'.2	45° 22'.4	27'.5	285° 57'.9	35'.1
05	168° 52'.6	228° 11'.1	31'.7	340° 12'.1	27'.6	60° 25'.2	27'.6	301° 00'.1	35'.1
06	183° 55'.1	243° 14'.0	31'.2	355° 13'.5	28'.0	75° 28'.0	27'.6	316° 02'.3	35'.2
07	198° 57'.5	258° 17'.0	30'.7	10° 14'.8	28'.5	90° 30'.8	27'.6	331° 04'.5	35'.3
08	214° 00'.0	273° 19'.9	30'.2	25° 16'.2	28'.9	105° 33'.6	27'.7	346° 06'.7	35'.3
09	229° 02'.5	288° 22'.9	29'.7	40° 17'.6	29'.4	120° 36'.4	27'.7	1° 09'.0	35'.4
10	244° 04'.9	303° 25'.9	29'.2	55° 19'.0	29'.8	135° 39'.2	27'.8	16° 11'.2	35'.4
11	259° 07'.4	318° 28'.8	28'.7	70° 20'.3	30'.2	150° 42'.1	27'.8	31° 13'.4	35'.5
12	274° 09'.9	333° 31'.8	19° 28'.1 S	85° 21'.7	1° 30'.7 S	165° 44'.9	22° 27'.9 N	46° 15'.6	15° 35'.6 S
13	289° 12'.3	348° 34'.8	27'.6	100° 23'.1	31'.1	180° 47'.7	27'.9	61° 17'.8	35'.6
14	304° 14'.8	3° 37'.8	27'.1	115° 24'.5	31'.5	195° 50'.5	28'.0	76° 20'.1	35'.7
15	319° 17'.2	18° 40'.8	26'.6	130° 25'.9	32'.0	210° 53'.3	28'.0	91° 22'.3	35'.7
16	334° 19'.7	33° 43'.8	26'.1	145° 27'.3	32'.4	225° 56'.1	28'.1	106° 24'.5	35'.8
17	349° 22'.2	48° 46'.8	25'.6	160° 28'.6	32'.8	240° 58'.9	28'.1	121° 26'.7	35'.9
18	4° 24'.6	63° 49'.8	25'.1	175° 30'.0	33'.3	256° 01'.7	28'.2	136° 28'.9	35'.9
19	19° 27'.1	78° 52'.8	24'.6	190° 31'.4	33'.7	271° 04'.5	28'.2	151° 31'.2	36'.0
20	34° 29'.6	93° 55'.8	24'.1	205° 32'.8	34'.1	286° 07'.3	28'.3	166° 33'.4	36'.0
21	49° 32'.0	108° 58'.8	23'.6	220° 34'.2	34'.5	301° 10'.2	28'.3	181° 35'.6	36'.1
22	64° 34'.5	124° 01'.8	23'.1	235° 35'.6	35'.0	316° 13'.0	28'.3	196° 37'.8	36'.2
23	79° 37'.0	139° 04'.8	22'.5	250° 36'.9	35'.4	331° 15'.8	28'.4	211° 40'.0	36'.2
26 Thursday 00	94° 39'.4	154° 07'.9	19° 22'.0 S	265° 38'.3	1° 35'.8 S	346° 18'.6	22° 28'.4 N	226° 42'.3	15° 36'.3 S
01	109° 41'.9	169° 10'.9	21'.5	280° 39'.7	36'.3	1° 21'.4	28'.5	241° 44'.5	36'.3
02	124° 44'.4	184° 13'.9	21'.0	295° 41'.1	36'.7	16° 24'.2	28'.5	256° 46'.7	36'.4
03	139° 46'.8	199° 17'.0	20'.5	310° 42'.5	37'.1	31° 27'.0	28'.6	271° 48'.9	36'.5
04	154° 49'.3	214° 20'.0	20'.0	325° 43'.9	37'.6	46° 29'.8	28'.6	286° 51'.2	36'.5
05	169° 51'.7	229° 23'.1	19'.5	340° 45'.2	38'.0	61° 32'.6	28'.7	301° 53'.4	36'.6
06	184° 54'.2	244° 26'.1	19'.0	355° 46'.6	38'.4	76° 35'.5	28'.7	316° 55'.6	36'.6
07	199° 56'.7	259° 29'.2	18'.5	10° 48'.0	38'.9	91° 38'.3	28'.8	331° 57'.8	36'.7
08	214° 59'.1	274° 32'.3	18'.0	25° 49'.4	39'.3	106° 41'.1	28'.8	347° 00'.0	36'.8
09	230° 01'.6	289° 35'.3	17'.5	40° 50'.8	39'.7	121° 43'.9	28'.9	2° 02'.3	36'.8
10	245° 04'.1	304° 38'.4	17'.0	55° 52'.2	40'.2	136° 46'.7	28'.9	17° 04'.5	36'.9
11	260° 06'.5	319° 41'.5	16'.5	70° 53'.6	40'.6	151° 49'.5	29'.0	32° 06'.7	36'.9
12	275° 09'.0	334° 44'.6	19° 16'.0 S	85° 54'.9	1° 41'.0 S	166° 52'.3	22° 29'.0 N	47° 08'.9	15° 37'.0 S
13	290° 11'.5	349° 47'.7	15'.5	100° 56'.3	41'.4	181° 55'.1	29'.0	62° 11'.2	37'.0
14	305° 13'.9	4° 50'.8	15'.0	115° 57'.7	41'.9	196° 57'.9	29'.1	77° 13'.4	37'.1
15	320° 16'.4	19° 53'.9	14'.5	130° 59'.1	42'.3	212° 00'.8	29'.1	92° 15'.6	37'.2
16	335° 18'.9	34° 57'.0	14'.0	146° 00'.5	42'.7	227° 03'.6	29'.2	107° 17'.8	37'.2
17	350° 21'.3	50° 00'.1	13'.5	161° 01'.9	43'.2	242° 06'.4	29'.2	122° 20'.0	37'.3
18	5° 23'.8	65° 03'.2	13'.0	176° 03'.3	43'.6	257° 09'.2	29'.3	137° 22'.3	37'.3
19	20° 26'.2	80° 06'.3	12'.5	191° 04'.7	44'.0	272° 12'.0	29'.3	152° 24'.5	37'.4
20	35° 28'.7	95° 09'.4	12'.0	206° 06'.1	44'.4	287° 14'.8	29'.4	167° 26'.7	37'.5
21	50° 31'.2	110° 12'.5	11'.5	221° 07'.4	44'.9	302° 17'.6	29'.4	182° 28'.9	37'.5
22	65° 33'.6	125° 15'.7	11'.0	236° 08'.8	45'.3	317° 20'.5	29'.5	197° 31'.2	37'.6
23	80° 36'.1	140° 18'.8	10'.5	251° 10'.2	45'.7	332° 23'.3	29'.5	212° 33'.4	37'.6
	M.P. 17:42	v 3'.0	d 0'.5	v 1'.4	d 0'.4	v 2'.8	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 15'.2 S
Achernar	335° 26'.4	57° 10'.2 S
Acrux	173° 08'.8	63° 10'.3 S
Adhara	255° 11'.8	28° 59'.6 S
Aldebaran	290° 48'.6	16° 32'.1 N
Alioth	166° 20'.6	55° 52'.7 N
Alkaid	152° 58'.9	49° 14'.4 N
Alnair	27° 43'.6	46° 53'.7 S
Alnilam	275° 45'.7	1° 11'.8 S
Alphard	217° 55'.5	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.1 N
Alpheratz	357° 43'.1	29° 10'.3 N
Altair	62° 08'.2	8° 54'.5 N
Ankaa	353° 15'.4	42° 14'.0 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.5 N
Atria	107° 28'.1	69° 02'.9 S
Avior	234° 17'.2	59° 33'.3 S
Bellatrix	278° 31'.3	6° 21'.6 N
Betelgeuse	271° 00'.6	7° 24'.4 N
Canopus	263° 55'.4	52° 42'.4 S
Capella	280° 33'.4	46° 00'.6 N
Deneb	49° 31'.6	45° 20'.1 N
Denebola	182° 33'.3	14° 29'.5 N
Diphda	348° 55'.5	17° 54'.7 S
Dubhe	193° 51'.1	61° 40'.1 N
Elnath	278° 11'.8	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.4 N
Enif	33° 47'.0	9° 56'.5 N
Fomalhaut	15° 23'.7	29° 32'.9 S
Gacrux	172° 00'.4	57° 11'.2 S
Gienah	175° 51'.9	17° 37'.1 S
Hadar	148° 47'.6	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 21'.0	74° 05'.7 N
Markab	13° 38'.0	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.3	36° 26'.1 S
Miaplacidus	221° 38'.8	69° 46'.4 S
Mirfak	308° 39'.4	49° 54'.7 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.4 S
Polaris	317° 16'.2	89° 19'.6 N
Pollux	243° 26'.9	27° 59'.3 N
Procyon	244° 59'.0	5° 11'.1 N
Rasalhague	96° 06'.5	12° 33'.2 N
Regulus	207° 43'.0	11° 53'.7 N
Rigel	281° 11'.4	8° 11'.3 S
Rigil Kent	139° 51'.5	60° 53'.2 S
Sabik	102° 12'.5	15° 44'.3 S
Schedar	349° 39'.9	56° 37'.2 N
Shaula	96° 21'.8	37° 06'.6 S
Sirius	258° 33'.0	16° 44'.3 S
Spica	158° 31'.0	11° 14'.0 S
Suhail	222° 51'.8	43° 29'.4 S
Vega	80° 39'.1	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.8 S

	SHA	Mer.Pass.
Venus	59° 16'.1	13:46
Mars	171° 24'.9	06:19
Jupiter	251° 30'.9	00:59
Saturn	132° 08'.7	08:55

SUN	GHA	Dec
24 00	180° 08'.9	23° 24'.9 S
01	195° 08'.6	24'.9
02	210° 08'.3	24'.8
03	225° 08'.0	24'.8
04	240° 07'.7	24'.7
05	255° 07'.4	24'.7
06	270° 07'.0	24'.6
07	285° 06'.7	24'.6
08	300° 06'.4	24'.5
09	315° 06'.1	24'.5
10	330° 05'.8	24'.4
11	345° 05'.5	24'.4
12	0° 05'.2	23° 24'.3 S
13	15° 04'.9	24'.2
14	30° 04'.6	24'.2
15	45° 04'.3	24'.1
16	60° 03'.9	24'.1
17	75° 03'.6	24'.0
18	90° 03'.3	24'.0
19	105° 03'.0	23'.9
20	120° 02'.7	23'.8
21	135° 02'.4	23'.8
22	150° 02'.1	23'.7
23	165° 01'.8	23'.6
25 00	180° 01'.5	23° 23'.6 S
01	195° 01'.2	23'.5
02	210° 00'.8	23'.5
03	225° 00'.5	23'.4
04	240° 00'.2	23'.3
05	254° 59'.9	23'.3
06	269° 59'.6	23'.2
07	284° 59'.3	23'.1
08	299° 59'.0	23'.0
09	314° 58'.7	23'.0
10	329° 58'.4	22'.9
11	344° 58'.1	22'.8
12	359° 57'.7	23° 22'.8 S
13	14° 57'.4	22'.7
14	29° 57'.1	22'.6
15	44° 56'.8	22'.5
16	59° 56'.5	22'.4
17	74° 56'.2	22'.4
18	89° 55'.9	22'.3
19	104° 55'.6	22'.2
20	119° 55'.3	22'.1
21	134° 55'.0	22'.1
22	149° 54'.7	22'.0
23	164° 54'.3	21'.9
26 00	179° 54'.0	23° 21'.8 S
01	194° 53'.7	21'.7
02	209° 53'.4	21'.6
03	224° 53'.1	21'.5
04	239° 52'.8	21'.5
05	254° 52'.5	21'.4
06	269° 52'.2	21'.3
07	284° 51'.9	21'.2
08	299° 51'.6	21'.1
09	314° 51'.3	21'.0
10	329° 50'.9	20'.9
11	344° 50'.6	20'.8
12	359° 50'.3	23° 20'.7 S
13	14° 50'.0	20'.6
14	29° 49'.7	20'.5
15	44° 49'.4	20'.4
16	59° 49'.1	20'.4
17	74° 48'.8	20'.3
18	89° 48'.5	20'.2
19	104° 48'.2	20'.1
20	119° 47'.9	20'.0
21	134° 47'.6	19'.9
22	149° 47'.2	19'.8
23	164° 46'.9	19'.7
	SD 16'.3	d 0'.1

MOON	GHA	v	Dec	d	HP
24 00	288° 33'.5	14'.8	2° 26'.5 N	10'.1	55'.0
01	303° 07'.3	14'.7	16'.4	10'.2	
02	317° 41'.0	14'.6	06'.2	10'.1	
03	332° 14'.6	14'.7	1° 56'.1 N	10'.1	55'.1
04	346° 48'.3	14'.7	46'.0	10'.2	
05	1° 22'.0	14'.6	35'.8	10'.2	
06	15° 55'.6	14'.6	25'.6	10'.2	
07	30° 29'.2	14'.6	15'.4	10'.2	55'.2
08	45° 02'.8	14'.6	05'.2	10'.2	
09	59° 36'.4	14'.5	0° 55'.0 N	10'.3	
10	74° 09'.9	14'.5	44'.7	10'.2	
11	88° 43'.4	14'.5	34'.5	10'.3	55'.3
12	103° 16'.9	14'.5	0° 24'.2 N	10'.3	55'.3
13	117° 50'.4	14'.5	13'.9	10'.2	
14	132° 23'.9	14'.4	03'.7	10'.3	
15	146° 57'.3	14'.4	0° 06'.6 S	10'.3	55'.4
16	161° 30'.7	14'.4	16'.9	10'.4	
17	176° 04'.1	14'.3	27'.3	10'.3	
18	190° 37'.4	14'.3	37'.6	10'.3	55'.5
19	205° 10'.7	14'.3	47'.9	10'.3	
20	219° 44'.0	14'.2	58'.2	10'.4	
21	234° 17'.2	14'.2	1° 08'.6 S	10'.3	
22	248° 50'.4	14'.2	18'.9	10'.4	55'.6
23	263° 23'.6	14'.2	29'.3	10'.3	
25 00	277° 56'.8	14'.1	1° 39'.6 S	10'.4	55'.6
01	292° 29'.9	14'.0	50'.0	10'.3	55'.7
02	307° 02'.9	14'.1	2° 00'.3 S	10'.4	
03	321° 36'.0	14'.0	10'.7	10'.3	
04	336° 09'.0	13'.9	21'.0	10'.4	
05	350° 41'.9	14'.0	31'.4	10'.4	55'.8
06	5° 14'.9	13'.8	41'.8	10'.3	
07	19° 47'.7	13'.9	52'.1	10'.4	
08	34° 20'.6	13'.8	3° 02'.5 S	10'.4	55'.9
09	48° 53'.4	13'.7	12'.9	10'.3	
10	63° 26'.1	13'.7	23'.2	10'.4	
11	77° 58'.8	13'.7	33'.6	10'.3	56'.0
12	92° 31'.5	13'.6	3° 43'.9 S	10'.3	56'.0
13	107° 04'.1	13'.6	54'.2	10'.4	
14	121° 36'.7	13'.5	4° 04'.6 S	10'.3	56'.1
15	136° 09'.2	13'.5	14'.9	10'.3	
16	150° 41'.7	13'.4	25'.2	10'.3	
17	165° 14'.1	13'.4	35'.5	10'.4	56'.2
18	179° 46'.5	13'.3	45'.9	10'.3	
19	194° 18'.8	13'.3	56'.2	10'.2	
20	208° 51'.1	13'.2	5° 06'.4 S	10'.3	56'.3
21	223° 23'.3	13'.2	16'.7	10'.3	
22	237° 55'.5	13'.1	27'.0	10'.2	
23	252° 27'.6	13'.1	37'.2	10'.3	56'.4
26 00	266° 59'.7	13'.0	5° 47'.5 S	10'.2	56'.4
01	281° 31'.7	12'.9	57'.7	10'.2	
02	296° 03'.6	12'.9	6° 07'.9 S	10'.2	56'.5
03	310° 35'.5	12'.8	18'.1	10'.2	
04	325° 07'.3	12'.8	28'.3	10'.1	
05	339° 39'.1	12'.7	38'.4	10'.2	56'.6
06	354° 10'.8	12'.6	48'.6	10'.1	
07	8° 42'.4	12'.6	58'.7	10'.1	
08	23° 14'.0	12'.5	7° 08'.8 S	10'.1	56'.7
09	37° 45'.5	12'.5	18'.9	10'.0	
10	52° 17'.0	12'.4	28'.9	10'.0	
11	66° 48'.4	12'.3	38'.9	10'.1	56'.8
12	81° 19'.7	12'.2	7° 49'.0 S	9'.9	56'.8
13	95° 50'.9	12'.2	58'.9	10'.0	56'.9
14	110° 22'.1	12'.2	8° 08'.9 S	9'.9	
15	124° 53'.3	12'.0	18'.8	9'.9	
16	139° 24'.3	12'.0	28'.7	9'.9	57'.0
17	153° 55'.3	11'.9	38'.6	9'.9	
18	168° 26'.2	11'.8	48'.5	9'.8	
19	182° 57'.0	11'.8	58'.3	9'.8	57'.1
20	197° 27'.8	11'.7	9° 08'.1 S	9'.7	
21	211° 58'.5	11'.6	17'.8	9'.8	57'.2
22	226° 29'.1	11'.6	27'.6	9'.6	
23	240° 59'.7	11'.4	37'.2	9'.7	
	SD 15'.1		15'.3		15'.5

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 24	Moonrise 25	Moonrise 26
N 72°	08:27	10:57	-	23:49	-	01:33
N 70°	08:07	09:55	-	23:47	-	01:24
68°	07:51	09:20	-	23:45	-	01:16
66°	07:38	08:55	10:35	23:43	-	01:10
64°	07:27	08:35	09:53	23:42	-	01:05
62°	07:17	08:19	09:25	23:41	-	01:00
60°	07:09	08:06	09:03	23:40	-	00:56
N 58°	07:01	07:54	08:46	23:39	-	00:53
56°	06:55	07:44	08:31	23:38	-	00:50
54°	06:48	07:35	08:19	23:37	-	00:47
52°	06:43	07:27	08:07	23:36	-	00:45
50°	06:38	07:19	07:58	23:36	-	00:42
45°	06:26	07:03	07:37	23:34	-	00:38
N 40°	06:15	06:50	07:20	23:33	-	00:34
35°	06:06	06:38	07:06	23:32	-	00:30
30°	05:57	06:27	06:54	23:32	-	00:27
20°	05:41	06:08	06:32	23:30	-	00:22
N 10°	05:25	05:51	06:14	23:29	-	00:17
0°	05:08	05:34	05:56	23:28	-	00:13
S 10°	04:49	05:16	05:39	23:27	-	00:09
20°	04:26	04:55	05:20	23:25	-	00:04
30°	03:57	04:30	04:58	23:24	23:59	24:37
35°	03:38	04:15	04:45	23:23	23:56	24:32
40°	03:15	03:57	04:30	23:22	23:53	24:26
45°	02:45	03:34	04:12	23:21	23:49	24:19
S 50°	01:59	03:05	03:49	23:20	23:45	24:12
52°	01:31	02:50	03:38	23:20	23:43	24:08
54°	00:45	02:32	03:26	23:19	23:40	24:04
56°	-	02:09	03:12	23:19	23:38	24:00
58°	-	01:39	02:55	23:18	23:35	23:55
S 60°	-	00:49	02:35	23:17	23:32	23:49
S 62°	-	-	02:08	23:16	23:29	23:43

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 24	Moonset 25	Moonset 26
N 72°	-	13:04	15:34	11:11	11:02	10:53
N 70°	-	14:05	15:53	11:10	11:07	11:05
68°	-	14:40	16:09	11:10	11:11	11:14
66°	13:25	15:05	16:22	11:09	11:15	11:21
64°	14:07	15:25	16:34	11:09	11:18	11:28
62°	14:35	15:41	16:43	11:09	11:20	11:33
60°	14:57	15:55	16:51	11:08	11:23	11:38
N 58°	15:14	16:06	16:59	11:08	11:25	11:43
56°	15:29	16:17	17:06	11:08	11:26	11:47
54°	15:42	16:26	17:12	11:08	11:28	11:50
52°	15:53	16:34	17:18	11:07	11:30	11:53
50°	16:03	16:41	17:23	11:07	11:31	11:56
45°	16:23	16:57	17:35	11:07	11:34	12:02
N 40°	16:40	17:11	17:45	11:07	11:36	12:08
35°	16:54	17:23	17:54	11:06	11:38	12:12
30°	17:07	17:33	18:03	11:06	11:40	12:16
20°	17:28	17:52	18:19	11:06	11:44	12:23
N 10°	17:46	18:09	18:36	11:05	11:46	12:30
0°	18:04	18:26	18:53	11:05	11:49	12:35
S 10°	18:21	18:45	19:12	11:04	11:52	12:41
20°	18:40	19:05	19:34	11:04	11:55	12:47
30°	19:02	19:30	20:03	11:03	11:58	12:54
35°	19:15	19:45	20:22	11:03	12:00	12:58
40°	19:30	20:03	20:45	11:03	12:02	13:03
45°	19:48	20:26	21:16	11:02	12:04	13:09
S 50°	20:11	20:55	22:01	11:02	12:07	13:15
52°	20:22	21:11	22:29	11:02	12:09	13:18
54°	20:34	21:28	23:14	11:01	12:10	13:21
56°	20:48	21:51	-	11:01	12:12	13:25
58°	21:05	22:20	-	11:01	12:14	13:29
S 60°	21:25	23:10	-	11:00	12:16	13:34
S 62°	21:52	-	-	11:00	12:18	13:39

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
24	0 36	0 21	12:00	04:54	17:16	21d 61%
25	0 06	0 08	12:00	05:38	18:01	22d 51%
26	0 23	0 38	12:01	06:24	18:48	23d 41%

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2013 December 27, 28, 29 (Fri, Sat, Sun)

GMT	ARIES	VENUS -4.5		MARS +0.9		JUPITER -2.7		SATURN +0.6	
	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
27 Friday 00	95° 38'.6	155° 22'.0	19° 10'.0 S	266° 11'.6	1° 46'.2 S	347° 26'.1	22° 29'.6 N	227° 35'.6	15° 37'.7 S
01	110° 41'.0	170° 25'.1	09'.5	281° 13'.0	46'.6	2° 28'.9	29'.6	242° 37'.8	37'.8
02	125° 43'.5	185° 28'.2	09'.0	296° 14'.4	47'.0	17° 31'.7	29'.6	257° 40'.1	37'.8
03	140° 46'.0	200° 31'.4	08'.5	311° 15'.8	47'.4	32° 34'.5	29'.7	272° 42'.3	37'.9
04	155° 48'.4	215° 34'.5	08'.0	326° 17'.2	47'.9	47° 37'.3	29'.7	287° 44'.5	37'.9
05	170° 50'.9	230° 37'.7	07'.5	341° 18'.6	48'.3	62° 40'.1	29'.8	302° 46'.7	38'.0
06	185° 53'.3	245° 40'.9	07'.0	356° 20'.0	48'.7	77° 43'.0	29'.8	317° 48'.9	38'.0
07	200° 55'.8	260° 44'.0	06'.5	11° 21'.4	49'.1	92° 45'.8	29'.9	332° 51'.2	38'.1
08	215° 58'.3	275° 47'.2	06'.0	26° 22'.8	49'.6	107° 48'.6	29'.9	347° 53'.4	38'.2
09	231° 00'.7	290° 50'.4	05'.5	41° 24'.2	50'.0	122° 51'.4	30'.0	2° 55'.6	38'.2
10	246° 03'.2	305° 53'.6	05'.0	56° 25'.5	50'.4	137° 54'.2	30'.0	17° 57'.8	38'.3
11	261° 05'.7	320° 56'.8	04'.5	71° 26'.9	50'.8	152° 57'.0	30'.1	33° 00'.1	38'.3
12	276° 08'.1	336° 00'.0	19° 04'.0 S	86° 28'.3	1° 51'.3 S	167° 59'.8	22° 30'.1 N	48° 02'.3	15° 38'.4 S
13	291° 10'.6	351° 03'.2	03'.5	101° 29'.7	51'.7	183° 02'.7	30'.2	63° 04'.5	38'.5
14	306° 13'.1	6° 06'.4	03'.0	116° 31'.1	52'.1	198° 05'.5	30'.2	78° 06'.7	38'.5
15	321° 15'.5	21° 09'.6	02'.5	131° 32'.5	52'.6	213° 08'.3	30'.3	93° 09'.0	38'.6
16	336° 18'.0	36° 12'.8	02'.0	146° 33'.9	53'.0	228° 11'.1	30'.3	108° 11'.2	38'.6
17	351° 20'.5	51° 16'.0	01'.5	161° 35'.3	53'.4	243° 13'.9	30'.3	123° 13'.4	38'.7
18	6° 22'.9	66° 19'.2	01'.0	176° 36'.7	53'.8	258° 16'.7	30'.4	138° 15'.6	38'.7
19	21° 25'.4	81° 22'.4	00'.6	191° 38'.1	54'.2	273° 19'.6	30'.4	153° 17'.9	38'.8
20	36° 27'.8	96° 25'.7	00'.1	206° 39'.5	54'.7	288° 22'.4	30'.5	168° 20'.1	38'.9
21	51° 30'.3	111° 28'.9	18° 59'.6 S	221° 40'.9	55'.1	303° 25'.2	30'.5	183° 22'.3	38'.9
22	66° 32'.8	126° 32'.1	59'.1	236° 42'.3	55'.5	318° 28'.0	30'.6	198° 24'.5	39'.0
23	81° 35'.2	141° 35'.4	58'.6	251° 43'.7	55'.9	333° 30'.8	30'.6	213° 26'.8	39'.0
28 Saturday 00	96° 37'.7	156° 38'.6	18° 58'.1 S	266° 45'.1	1° 56'.4 S	348° 33'.6	22° 30'.7 N	228° 29'.0	15° 39'.1 S
01	111° 40'.2	171° 41'.9	57'.6	281° 46'.5	56'.8	3° 36'.5	30'.7	243° 31'.2	39'.2
02	126° 42'.6	186° 45'.1	57'.1	296° 47'.9	57'.2	18° 39'.3	30'.8	258° 33'.4	39'.2
03	141° 45'.1	201° 48'.4	56'.6	311° 49'.3	57'.6	33° 42'.1	30'.8	273° 35'.7	39'.3
04	156° 47'.6	216° 51'.6	56'.1	326° 50'.7	58'.1	48° 44'.9	30'.9	288° 37'.9	39'.3
05	171° 50'.0	231° 54'.9	55'.6	341° 52'.1	58'.5	63° 47'.7	30'.9	303° 40'.1	39'.4
06	186° 52'.5	246° 58'.2	55'.2	356° 53'.5	58'.9	78° 50'.5	30'.9	318° 42'.4	39'.4
07	201° 55'.0	262° 01'.4	54'.7	11° 54'.9	59'.3	93° 53'.4	31'.0	333° 44'.6	39'.5
08	216° 57'.4	277° 04'.7	54'.2	26° 56'.3	59'.8	108° 56'.2	31'.0	348° 46'.8	39'.6
09	231° 59'.9	292° 08'.0	53'.7	41° 57'.7	2° 00'.2 S	123° 59'.0	31'.1	3° 49'.0	39'.6
10	247° 02'.3	307° 11'.3	53'.2	56° 59'.1	00'.6	139° 01'.8	31'.1	18° 51'.3	39'.7
11	262° 04'.8	322° 14'.6	52'.7	72° 00'.5	01'.0	154° 04'.6	31'.2	33° 53'.5	39'.7
12	277° 07'.3	337° 17'.9	18° 52'.2 S	87° 01'.9	2° 01'.4 S	169° 07'.4	22° 31'.2 N	48° 55'.7	15° 39'.8 S
13	292° 09'.7	352° 21'.2	51'.8	102° 03'.3	01'.9	184° 10'.3	31'.3	63° 57'.9	39'.8
14	307° 12'.2	7° 24'.5	51'.3	117° 04'.7	02'.3	199° 13'.1	31'.3	79° 00'.2	39'.9
15	322° 14'.7	22° 27'.8	50'.8	132° 06'.1	02'.7	214° 15'.9	31'.4	94° 02'.4	40'.0
16	337° 17'.1	37° 31'.1	50'.3	147° 07'.5	03'.1	229° 18'.7	31'.4	109° 04'.6	40'.0
17	352° 19'.6	52° 34'.4	49'.8	162° 08'.9	03'.5	244° 21'.5	31'.5	124° 06'.8	40'.1
18	7° 22'.1	67° 37'.7	49'.3	177° 10'.3	04'.0	259° 24'.3	31'.5	139° 09'.1	40'.1
19	22° 24'.5	82° 41'.1	48'.9	192° 11'.7	04'.4	274° 27'.2	31'.6	154° 11'.3	40'.2
20	37° 27'.0	97° 44'.4	48'.4	207° 13'.1	04'.8	289° 30'.0	31'.6	169° 13'.5	40'.2
21	52° 29'.4	112° 47'.7	47'.9	222° 14'.5	05'.2	304° 32'.8	31'.6	184° 15'.8	40'.3
22	67° 31'.9	127° 51'.1	47'.4	237° 16'.0	05'.6	319° 35'.6	31'.7	199° 18'.0	40'.4
23	82° 34'.4	142° 54'.4	46'.9	252° 17'.4	06'.1	334° 38'.4	31'.7	214° 20'.2	40'.4
29 Sunday 00	97° 36'.8	157° 57'.8	18° 46'.4 S	267° 18'.8	2° 06'.5 S	349° 41'.3	22° 31'.8 N	229° 22'.4	15° 40'.5 S
01	112° 39'.3	173° 01'.1	46'.0	282° 20'.2	06'.9	4° 44'.1	31'.8	244° 24'.7	40'.5
02	127° 41'.8	188° 04'.5	45'.5	297° 21'.6	07'.3	19° 46'.9	31'.9	259° 26'.9	40'.6
03	142° 44'.2	203° 07'.8	45'.0	312° 23'.0	07'.7	34° 49'.7	31'.9	274° 29'.1	40'.6
04	157° 46'.7	218° 11'.2	44'.5	327° 24'.4	08'.2	49° 52'.5	32'.0	289° 31'.4	40'.7
05	172° 49'.2	233° 14'.6	44'.0	342° 25'.8	08'.6	64° 55'.4	32'.0	304° 33'.6	40'.8
06	187° 51'.6	248° 18'.0	43'.6	357° 27'.2	09'.0	79° 58'.2	32'.1	319° 35'.8	40'.8
07	202° 54'.1	263° 21'.3	43'.1	12° 28'.6	09'.4	95° 01'.0	32'.1	334° 38'.0	40'.9
08	217° 56'.6	278° 24'.7	42'.6	27° 30'.0	09'.8	110° 03'.8	32'.2	349° 40'.3	40'.9
09	232° 59'.0	293° 28'.1	42'.1	42° 31'.4	10'.3	125° 06'.6	32'.2	4° 42'.5	41'.0
10	248° 01'.5	308° 31'.5	41'.7	57° 32'.8	10'.7	140° 09'.4	32'.2	19° 44'.7	41'.0
11	263° 03'.9	323° 34'.9	41'.2	72° 34'.3	11'.1	155° 12'.3	32'.3	34° 47'.0	41'.1
12	278° 06'.4	338° 38'.3	18° 40'.7 S	87° 35'.7	2° 11'.5 S	170° 15'.1	22° 32'.3 N	49° 49'.2	15° 41'.2 S
13	293° 08'.9	353° 41'.7	40'.2	102° 37'.1	11'.9	185° 17'.9	32'.4	64° 51'.4	41'.2
14	308° 11'.3	8° 45'.1	39'.8	117° 38'.5	12'.3	200° 20'.7	32'.4	79° 53'.6	41'.3
15	323° 13'.8	23° 48'.5	39'.3	132° 39'.9	12'.8	215° 23'.5	32'.5	94° 55'.9	41'.3
16	338° 16'.3	38° 51'.9	38'.8	147° 41'.3	13'.2	230° 26'.4	32'.5	109° 58'.1	41'.4
17	353° 18'.7	53° 55'.3	38'.3	162° 42'.7	13'.6	245° 29'.2	32'.6	125° 00'.3	41'.4
18	8° 21'.2	68° 58'.8	37'.9	177° 44'.1	14'.0	260° 32'.0	32'.6	140° 02'.6	41'.5
19	23° 23'.7	84° 02'.2	37'.4	192° 45'.5	14'.4	275° 34'.8	32'.7	155° 04'.8	41'.6
20	38° 26'.1	99° 05'.6	36'.9	207° 47'.0	14'.8	290° 37'.6	32'.7	170° 07'.0	41'.6
21	53° 28'.6	114° 09'.1	36'.4	222° 48'.4	15'.3	305° 40'.5	32'.8	185° 09'.3	41'.7
22	68° 31'.1	129° 12'.5	36'.0	237° 49'.8	15'.7	320° 43'.3	32'.8	200° 11'.5	41'.7
23	83° 33'.5	144° 15'.9	35'.5	252° 51'.2	16'.1	335° 46'.1	32'.9	215° 13'.7	41'.8
	M.P. 17:31	v 3'.3	d 0'.5	v 1'.4	d 0'.4	v 2'.8	d 0'.0	v 2'.2	d 0'.1

STARS	SHA	Dec
Acamar	315° 17'.8	40° 15'.2 S
Achernar	335° 26'.4	57° 10'.2 S
Acrux	173° 08'.8	63° 10'.3 S
Adhara	255° 11'.8	28° 59'.7 S
Aldebaran	290° 48'.6	16° 32'.1 N
Alioth	166° 20'.5	55° 52'.7 N
Alkaid	152° 58'.8	49° 14'.4 N
Alnair	27° 43'.6	46° 53'.7 S
Alnilam	275° 45'.6	1° 11'.8 S
Alphard	217° 55'.5	8° 43'.3 S
Alphecca	126° 11'.0	26° 40'.0 N
Alpheratz	357° 43'.1	29° 10'.3 N
Altair	62° 08'.2	8° 54'.5 N
Ankaa	353° 15'.4	42° 14'.0 S
Antares	112° 26'.1	26° 27'.6 S
Arcturus	145° 55'.6	19° 06'.5 N
Atria	107° 28'.1	69° 02'.9 S
Avior	234° 17'.2	59° 33'.3 S
Bellatrix	278° 31'.3	6° 21'.5 N
Betelgeuse	271° 00'.5	7° 24'.4 N
Canopus	263° 55'.4	52° 42'.4 S
Capella	280° 33'.4	46° 00'.6 N
Deneb	49° 31'.6	45° 20'.1 N
Denebola	182° 33'.2	14° 29'.5 N
Diphda	348° 55'.5	17° 54'.7 S
Dubhe	193° 51'.1	61° 40'.1 N
Elnath	278° 11'.8	28° 37'.0 N
Eltanin	90° 46'.5	51° 29'.4 N
Enif	33° 47'.0	9° 56'.5 N
Fomalhaut	15° 23'.7	29° 32'.9 S
Gacrux	172° 00'.4	57° 11'.2 S
Gienah	175° 51'.9	17° 37'.1 S
Hadar	148° 47'.5	60° 26'.1 S
Hamal	328° 00'.1	23° 31'.8 N
Kaus Aust.	83° 43'.7	34° 22'.5 S
Kochab	137° 20'.9	74° 05'.7 N
Markab	13° 38'.1	15° 17'.0 N
Menkar	314° 14'.4	4° 08'.6 N
Menkent	148° 07'.3	36° 26'.1 S
Miaplacidus	221° 38'.7	69° 46'.4 S
Mirfak	308° 39'.4	49° 54'.7 N
Nunki	75° 58'.2	26° 16'.6 S
Peacock	53° 19'.2	56° 41'.3 S
Polaris	317° 17'.1	89° 19'.7 N
Pollux	243° 26'.9	27° 59'.3 N
Procyon	244° 59'.0	5° 11'.1 N
Rasalhague	96° 06'.4	12° 33'.1 N
Regulus	207° 42'.9	11° 53'.7 N
Rigel	281° 11'.4	8° 11'.3 S
Rigil Kent	139° 51'.5	60° 53'.2 S
Sabik	102° 12'.4	15° 44'.3 S
Schedar	349° 39'.9	56° 37'.2 N
Shaula	96° 21'.8	37° 06'.6 S
Sirius	258° 33'.0	16° 44'.3 S
Spica	158° 30'.9	11° 14'.0 S
Suhail	222° 51'.8	43° 29'.4 S
Vega	80° 39'.1	38° 48'.0 N
Zuben'ubi	137° 05'.2	16° 05'.8 S

	SHA	Mer.Pass.
Venus	60° 00'.9	13:30
Mars	170° 07'.4	06:12
Jupiter	251° 55'.9	00:46
Saturn	131° 51'.3	08:45

GMT	SUN GHA	SUN Dec	MOON GHA	v	MOON Dec	d	HP
27 00	179° 46'.6	23° 19'.5 S	255° 30'.1	11'.4	9° 46'.9 S	9'.6	57'.3
01	194° 46'.3	19'.4	270° 00'.5	11'.4	56'.5	9'.6	
02	209° 46'.0	19'.3	284° 30'.9	11'.2	10° 06'.1 S	9'.5	57'.4
03	224° 45'.7	19'.2	299° 01'.1	11'.2	15'.6	9'.5	
04	239° 45'.4	19'.1	313° 31'.3	11'.0	25'.1	9'.5	
05	254° 45'.1	19'.0	328° 01'.3	11'.0	34'.6	9'.4	57'.5
06	269° 44'.8	18'.9	342° 31'.3	11'.0	44'.0	9'.4	
07	284° 44'.5	18'.8	357° 01'.3	10'.8	53'.4	9'.3	57'.6
08	299° 44'.2	18'.7	11° 31'.1	10'.8	11° 02'.7 S	9'.3	
09	314° 43'.9	18'.6	26° 00'.9	10'.6	12'.0	9'.3	
10	329° 43'.5	18'.5	40° 30'.5	10'.6	21'.3	9'.1	57'.7
11	344° 43'.2	18'.4	55° 00'.1	10'.6	30'.4	9'.2	
12	359° 42'.9	23° 18'.2 S	69° 29'.7	10'.4	11° 39'.6 S	9'.1	57'.8
13	14° 42'.6	18'.1	83° 59'.1	10'.3	48'.7	9'.0	
14	29° 42'.3	18'.0	98° 28'.4	10'.3	57'.7	9'.0	
15	44° 42'.0	17'.9	112° 57'.7	10'.1	12° 06'.7 S	9'.0	57'.9
16	59° 41'.7	17'.8	127° 26'.8	10'.1	15'.7	8'.9	
17	74° 41'.4	17'.7	141° 55'.9	10'.0	24'.6	8'.8	58'.0
18	89° 41'.1	17'.6	156° 24'.9	9'.9	33'.4	8'.8	
19	104° 40'.8	17'.4	170° 53'.8	9'.9	42'.2	8'.7	
20	119° 40'.5	17'.3	185° 22'.7	9'.7	50'.9	8'.7	58'.1
21	134° 40'.2	17'.2	199° 51'.4	9'.6	59'.6	8'.6	
22	149° 39'.9	17'.1	214° 20'.0	9'.6	13° 08'.2 S	8'.5	58'.2
23	164° 39'.6	17'.0	228° 48'.6	9'.5	16'.7	8'.5	
28 00	179° 39'.3	23° 16'.8 S	243° 17'.1	9'.3	13° 25'.2 S	8'.4	58'.2
01	194° 38'.9	16'.7	257° 45'.4	9'.3	33'.6	8'.4	58'.3
02	209° 38'.6	16'.6	272° 13'.7	9'.2	42'.0	8'.2	
03	224° 38'.3	16'.5	286° 41'.9	9'.1	50'.2	8'.3	58'.4
04	239° 38'.0	16'.3	301° 10'.0	9'.0	58'.5	8'.1	
05	254° 37'.7	16'.2	315° 38'.0	8'.9	14° 06'.6 S	8'.1	58'.5
06	269° 37'.4	16'.1	330° 05'.9	8'.9	14'.7	8'.0	
07	284° 37'.1	15'.9	344° 33'.8	8'.7	22'.7	7'.9	
08	299° 36'.8	15'.8	359° 01'.5	8'.6	30'.6	7'.9	58'.6
09	314° 36'.5	15'.7	13° 29'.1	8'.6	38'.5	7'.8	
10	329° 36'.2	15'.6	27° 56'.7	8'.4	46'.3	7'.7	58'.7
11	344° 35'.9	15'.4	42° 24'.1	8'.4	54'.0	7'.6	
12	359° 35'.6	23° 15'.3 S	56° 51'.5	8'.3	15° 01'.6 S	7'.6	58'.7
13	14° 35'.3	15'.2	71° 18'.8	8'.2	09'.2	7'.5	58'.8
14	29° 35'.0	15'.0	85° 46'.0	8'.0	16'.7	7'.4	
15	44° 34'.7	14'.9	100° 13'.0	8'.0	24'.1	7'.3	58'.9
16	59° 34'.4	14'.8	114° 40'.0	7'.9	31'.4	7'.2	
17	74° 34'.1	14'.6	129° 06'.9	7'.8	38'.6	7'.2	
18	89° 33'.7	14'.5	143° 33'.7	7'.7	45'.8	7'.0	59'.0
19	104° 33'.4	14'.3	158° 00'.4	7'.7	52'.8	7'.0	
20	119° 33'.1	14'.2	172° 27'.1	7'.5	59'.8	6'.9	59'.1
21	134° 32'.8	14'.1	186° 53'.6	7'.4	16° 06'.7 S	6'.8	
22	149° 32'.5	13'.9	201° 20'.0	7'.3	13'.5	6'.7	
23	164° 32'.2	13'.8	215° 46'.3	7'.3	20'.2	6'.6	59'.2
29 00	179° 31'.9	23° 13'.6 S	230° 12'.6	7'.1	16° 26'.8 S	6'.5	59'.2
01	194° 31'.6	13'.5	244° 38'.7	7'.1	33'.3	6'.4	59'.3
02	209° 31'.3	13'.4	259° 04'.8	7'.0	39'.7	6'.3	
03	224° 31'.0	13'.2	273° 30'.8	6'.8	46'.0	6'.2	
04	239° 30'.7	13'.1	287° 56'.6	6'.8	52'.2	6'.2	59'.4
05	254° 30'.4	12'.9	302° 22'.4	6'.7	58'.4	6'.0	
06	269° 30'.1	12'.8	316° 48'.1	6'.6	17° 04'.4 S	5'.9	59'.5
07	284° 29'.8	12'.6	331° 13'.7	6'.6	10'.3	5'.8	
08	299° 29'.5	12'.5	345° 39'.3	6'.4	16'.1	5'.7	
09	314° 29'.2	12'.3	0° 04'.7	6'.3	21'.8	5'.6	59'.6
10	329° 28'.9	12'.2	14° 30'.0	6'.3	27'.4	5'.5	
11	344° 28'.6	12'.0	28° 55'.3	6'.1	32'.9	5'.4	59'.7
12	359° 28'.3	23° 11'.9 S	43° 20'.4	6'.1	17° 38'.3 S	5'.3	59'.7
13	14° 28'.0	11'.7	57° 45'.5	6'.0	43'.6	5'.2	
14	29° 27'.7	11'.6	72° 10'.5	5'.9	48'.8	5'.0	59'.8
15	44° 27'.4	11'.4	86° 35'.4	5'.8	53'.8	5'.0	
16	59° 27'.1	11'.3	101° 00'.2	5'.8	58'.8	4'.8	
17	74° 26'.7	11'.1	115° 25'.0	5'.6	18° 03'.6 S	4'.7	59'.9
18	89° 26'.4	10'.9	129° 49'.6	5'.6	08'.3	4'.6	
19	104° 26'.1	10'.8	144° 14'.2	5'.5	12'.9	4'.5	
20	119° 25'.8	10'.6	158° 38'.7	5'.4	17'.4	4'.4	60'.0
21	134° 25'.5	10'.5	173° 03'.1	5'.3	21'.8	4'.2	
22	149° 25'.2	10'.3	187° 27'.4	5'.3	26'.0	4'.1	60'.1
23	164° 24'.9	10'.1	201° 51'.7	5'.1	30'.1	4'.0	
	SD 16'.3	d 0'.1	SD 15'.7		16'.0	16'.3	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 27	Moonrise 28	Moonrise 29
N 72°	08:26	10:52	-	03:23	05:25	07:57
N 70°	08:07	09:54	-	03:05	04:54	06:50
68°	07:51	09:19	-	02:51	04:31	06:14
66°	07:38	08:55	10:33	02:40	04:14	05:49
64°	07:27	08:35	09:52	02:31	04:00	05:29
62°	07:18	08:19	09:25	02:23	03:48	05:13
60°	07:09	08:06	09:03	02:16	03:38	05:00
N 58°	07:02	07:55	08:46	02:10	03:29	04:48
56°	06:55	07:44	08:32	02:04	03:21	04:38
54°	06:49	07:35	08:19	02:00	03:14	04:30
52°	06:44	07:27	08:08	01:55	03:08	04:22
50°	06:38	07:20	07:58	01:51	03:03	04:15
45°	06:27	07:04	07:38	01:43	02:51	04:00
N 40°	06:16	06:51	07:21	01:36	02:41	03:48
35°	06:07	06:39	07:07	01:30	02:32	03:37
30°	05:59	06:28	06:55	01:25	02:25	03:28
20°	05:42	06:10	06:34	01:16	02:13	03:12
N 10°	05:26	05:52	06:15	01:08	02:02	02:59
0°	05:09	05:35	05:58	01:01	01:51	02:46
S 10°	04:50	05:17	05:40	00:53	01:41	02:33
20°	04:28	04:57	05:22	00:45	01:30	02:20
30°	03:59	04:32	05:00	00:37	01:18	02:05
35°	03:40	04:17	04:47	00:32	01:11	01:56
40°	03:17	03:59	04:32	00:26	01:03	01:46
45°	02:47	03:37	04:14	00:19	00:54	01:34
S 50°	02:02	03:07	03:51	00:12	00:43	01:20
52°	01:35	02:52	03:41	00:08	00:38	01:13
54°	00:50	02:34	03:28	00:04	00:32	01:06
56°	-	02:12	03:14	-	00:26	00:58
58°	-	01:43	02:58	-	00:19	00:49
S 60°	-	00:55	02:38	-	00:11	00:38
S 62°	-	-	02:12	-	00:02	00:26

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 27	Moonset 28	Moonset 29
N 72°	-	13:11	15:37	10:43	10:28	09:52
N 70°	-	14:10	15:57	11:02	11:00	10:59
68°	-	14:44	16:12	11:17	11:24	11:36
66°	13:30	15:09	16:25	11:30	11:42	12:02
64°	14:11	15:28	16:36	11:40	11:57	12:22
62°	14:39	15:44	16:46	11:49	12:10	12:39
60°	15:00	15:57	16:54	11:57	12:21	12:53
N 58°	15:17	16:09	17:01	12:04	12:30	13:05
56°	15:32	16:19	17:08	12:10	12:38	13:15
54°	15:44	16:28	17:14	12:15	12:46	13:24
52°	15:55	16:36	17:20	12:20	12:52	13:32
50°	16:05	16:43	17:25	12:25	12:58	13:39
45°	16:26	16:59	17:37	12:34	13:11	13:55
N 40°	16:42	17:13	17:47	12:42	13:22	14:08
35°	16:56	17:24	17:56	12:49	13:31	14:19
30°	17:09	17:35	18:05	12:56	13:39	14:29
20°	17:30	17:54	18:21	13:06	13:53	14:45
N 10°	17:48	18:11	18:37	13:16	14:05	15:00
0°	18:05	18:28	18:54	13:24	14:17	15:14
S 10°	18:23	18:46	19:13	13:33	14:28	15:27
20°	18:42	19:06	19:35	13:43	14:41	15:42
30°	19:04	19:31	20:04	13:53	14:55	15:58
35°	19:16	19:46	20:23	14:00	15:03	16:08
40°	19:31	20:04	20:46	14:07	15:12	16:19
45°	19:49	20:26	21:16	14:15	15:23	16:32
S 50°	20:12	20:56	22:01	14:25	15:37	16:48
52°	20:22	21:11	22:28	14:30	15:43	16:56
54°	20:34	21:28	23:11	14:35	15:50	17:04
56°	20:48	21:50	-	14:40	15:57	17:13
58°	21:05	22:19	-	14:47	16:06	17:24
S 60°	21:25	23:06	-	14:54	16:16	17:36
S 62°	21:51	-	-	15:02	16:27	17:51

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
27	0 53	1 08	12:01	07:12	19:38	24d 31%
28	1 22	1 37	12:02	08:04	20:31	25d 21%
29	1 52	2 06	12:02	09:00	21:29	26d 13%

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2013 Dec 30, 31, Jan. 1 (Mon, Tue, Wed)

GMT		ARIES	VENUS -4.4		MARS +0.9		JUPITER -2.7		SATURN +0.6	
		GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec
30 Monday	00	98° 36'.0	159° 19'.4	18° 35'.0 S	267° 52'.6	2° 16'.5 S	350° 48'.9	22° 32'.9 N	230° 15'.9	15° 41'.8 S
	01	113° 38'.4	174° 22'.9	34'.6	282° 54'.0	16'.9	5° 51'.8	32'.9	245° 18'.2	41'.9
	02	128° 40'.9	189° 26'.3	34'.1	297° 55'.4	17'.3	20° 54'.6	33'.0	260° 20'.4	41'.9
	03	143° 43'.4	204° 29'.8	33'.6	312° 56'.9	17'.8	35° 57'.4	33'.0	275° 22'.6	42'.0
	04	158° 45'.8	219° 33'.2	33'.1	327° 58'.3	18'.2	51° 00'.2	33'.1	290° 24'.9	42'.1
	05	173° 48'.3	234° 36'.7	32'.7	342° 59'.7	18'.6	66° 03'.0	33'.1	305° 27'.1	42'.1
	06	188° 50'.8	249° 40'.2	32'.2	358° 01'.1	19'.0	81° 05'.9	33'.2	320° 29'.3	42'.2
	07	203° 53'.2	264° 43'.7	31'.7	13° 02'.5	19'.4	96° 08'.7	33'.2	335° 31'.6	42'.2
	08	218° 55'.7	279° 47'.1	31'.3	28° 03'.9	19'.8	111° 11'.5	33'.3	350° 33'.8	42'.3
	09	233° 58'.2	294° 50'.6	30'.8	43° 05'.4	20'.2	126° 14'.3	33'.3	5° 36'.0	42'.3
	10	249° 00'.6	309° 54'.1	30'.3	58° 06'.8	20'.7	141° 17'.1	33'.4	20° 38'.3	42'.4
	11	264° 03'.1	324° 57'.6	29'.9	73° 08'.2	21'.1	156° 20'.0	33'.4	35° 40'.5	42'.4
	12	279° 05'.6	340° 01'.1	18° 29'.4 S	88° 09'.6	2° 21'.5 S	171° 22'.8	22° 33'.5 N	50° 42'.7	15° 42'.5 S
	13	294° 08'.0	355° 04'.6	28'.9	103° 11'.0	21'.9	186° 25'.6	33'.5	65° 45'.0	42'.6
	14	309° 10'.5	10° 08'.1	28'.5	118° 12'.4	22'.3	201° 28'.4	33'.5	80° 47'.2	42'.6
	15	324° 12'.9	25° 11'.6	28'.0	133° 13'.9	22'.7	216° 31'.3	33'.6	95° 49'.4	42'.7
	16	339° 15'.4	40° 15'.1	27'.5	148° 15'.3	23'.1	231° 34'.1	33'.6	110° 51'.7	42'.7
	17	354° 17'.9	55° 18'.7	27'.1	163° 16'.7	23'.5	246° 36'.9	33'.7	125° 53'.9	42'.8
	18	9° 20'.3	70° 22'.2	26'.6	178° 18'.1	24'.0	261° 39'.7	33'.7	140° 56'.1	42'.8
	19	24° 22'.8	85° 25'.7	26'.2	193° 19'.5	24'.4	276° 42'.5	33'.8	155° 58'.3	42'.9
	20	39° 25'.3	100° 29'.2	25'.7	208° 21'.0	24'.8	291° 45'.4	33'.8	171° 00'.6	42'.9
	21	54° 27'.7	115° 32'.8	25'.2	223° 22'.4	25'.2	306° 48'.2	33'.9	186° 02'.8	43'.0
	22	69° 30'.2	130° 36'.3	24'.8	238° 23'.8	25'.6	321° 51'.0	33'.9	201° 05'.0	43'.1
	23	84° 32'.7	145° 39'.8	24'.3	253° 25'.2	26'.0	336° 53'.8	34'.0	216° 07'.3	43'.1
31 Tuesday	00	99° 35'.1	160° 43'.4	18° 23'.8 S	268° 26'.6	2° 26'.4 S	351° 56'.7	22° 34'.0 N	231° 09'.5	15° 43'.2 S
	01	114° 37'.6	175° 46'.9	23'.4	283° 28'.1	26'.8	6° 59'.5	34'.1	246° 11'.7	43'.2
	02	129° 40'.1	190° 50'.5	22'.9	298° 29'.5	27'.2	22° 02'.3	34'.1	261° 14'.0	43'.3
	03	144° 42'.5	205° 54'.0	22'.5	313° 30'.9	27'.7	37° 05'.1	34'.1	276° 16'.2	43'.3
	04	159° 45'.0	220° 57'.6	22'.0	328° 32'.3	28'.1	52° 07'.9	34'.2	291° 18'.4	43'.4
	05	174° 47'.4	236° 01'.2	21'.6	343° 33'.8	28'.5	67° 10'.8	34'.2	306° 20'.7	43'.4
	06	189° 49'.9	251° 04'.7	21'.1	358° 35'.2	28'.9	82° 13'.6	34'.3	321° 22'.9	43'.5
	07	204° 52'.4	266° 08'.3	20'.6	13° 36'.6	29'.3	97° 16'.4	34'.3	336° 25'.1	43'.6
	08	219° 54'.8	281° 11'.9	20'.2	28° 38'.0	29'.7	112° 19'.2	34'.4	351° 27'.4	43'.6
	09	234° 57'.3	296° 15'.5	19'.7	43° 39'.5	30'.1	127° 22'.1	34'.4	6° 29'.6	43'.7
	10	249° 59'.8	311° 19'.1	19'.3	58° 40'.9	30'.5	142° 24'.9	34'.5	21° 31'.8	43'.7
	11	265° 02'.2	326° 22'.6	18'.8	73° 42'.3	30'.9	157° 27'.7	34'.5	36° 34'.1	43'.8
	12	280° 04'.7	341° 26'.2	18° 18'.4 S	88° 43'.7	2° 31'.3 S	172° 30'.5	22° 34'.6 N	51° 36'.3	15° 43'.8 S
	13	295° 07'.2	356° 29'.8	17'.9	103° 45'.2	31'.8	187° 33'.4	34'.6	66° 38'.6	43'.9
	14	310° 09'.6	11° 33'.4	17'.5	118° 46'.6	32'.2	202° 36'.2	34'.7	81° 40'.8	43'.9
	15	325° 12'.1	26° 37'.0	17'.0	133° 48'.0	32'.6	217° 39'.0	34'.7	96° 43'.0	44'.0
	16	340° 14'.6	41° 40'.6	16'.5	148° 49'.4	33'.0	232° 41'.8	34'.7	111° 45'.3	44'.0
	17	355° 17'.0	56° 44'.3	16'.1	163° 50'.9	33'.4	247° 44'.7	34'.8	126° 47'.5	44'.1
	18	10° 19'.5	71° 47'.9	15'.6	178° 52'.3	33'.8	262° 47'.5	34'.8	141° 49'.7	44'.2
	19	25° 21'.9	86° 51'.5	15'.2	193° 53'.7	34'.2	277° 50'.3	34'.9	156° 52'.0	44'.2
	20	40° 24'.4	101° 55'.1	14'.7	208° 55'.2	34'.6	292° 53'.1	34'.9	171° 54'.2	44'.3
	21	55° 26'.9	116° 58'.7	14'.3	223° 56'.6	35'.0	307° 55'.9	35'.0	186° 56'.4	44'.3
	22	70° 29'.3	132° 02'.4	13'.8	238° 58'.0	35'.4	322° 58'.8	35'.0	201° 58'.7	44'.4
	23	85° 31'.8	147° 06'.0	13'.4	253° 59'.5	35'.8	338° 01'.6	35'.1	217° 00'.9	44'.4
1 Wednesday	00	100° 34'.3	162° 09'.6	18° 12'.9 S	269° 00'.9	2° 36'.2 S	353° 04'.4	22° 35'.1 N	232° 03'.1	15° 44'.5 S
	01	115° 36'.7	177° 13'.3	12'.5	284° 02'.3	36'.6	8° 07'.2	35'.2	247° 05'.4	44'.5
	02	130° 39'.2	192° 16'.9	12'.0	299° 03'.7	37'.1	23° 10'.1	35'.2	262° 07'.6	44'.6
	03	145° 41'.7	207° 20'.6	11'.6	314° 05'.2	37'.5	38° 12'.9	35'.3	277° 09'.8	44'.6
	04	160° 44'.1	222° 24'.2	11'.2	329° 06'.6	37'.9	53° 15'.7	35'.3	292° 12'.1	44'.7
	05	175° 46'.6	237° 27'.9	10'.7	344° 08'.0	38'.3	68° 18'.5	35'.3	307° 14'.3	44'.8
	06	190° 49'.1	252° 31'.5	10'.3	359° 09'.5	38'.7	83° 21'.4	35'.4	322° 16'.6	44'.8
	07	205° 51'.5	267° 35'.2	09'.8	14° 10'.9	39'.1	98° 24'.2	35'.4	337° 18'.8	44'.9
	08	220° 54'.0	282° 38'.9	09'.4	29° 12'.3	39'.5	113° 27'.0	35'.5	352° 21'.0	44'.9
	09	235° 56'.4	297° 42'.5	08'.9	44° 13'.8	39'.9	128° 29'.8	35'.5	7° 23'.3	45'.0
	10	250° 58'.9	312° 46'.2	08'.5	59° 15'.2	40'.3	143° 32'.7	35'.6	22° 25'.5	45'.0
	11	266° 01'.4	327° 49'.9	08'.0	74° 16'.6	40'.7	158° 35'.5	35'.6	37° 27'.7	45'.1
	12	281° 03'.8	342° 53'.6	18° 07'.6 S	89° 18'.1	2° 41'.1 S	173° 38'.3	22° 35'.7 N	52° 30'.0	15° 45'.1 S
	13	296° 06'.3	357° 57'.3	07'.2	104° 19'.5	41'.5	188° 41'.1	35'.7	67° 32'.2	45'.2
	14	311° 08'.8	13° 00'.9	06'.7	119° 20'.9	41'.9	203° 44'.0	35'.8	82° 34'.4	45'.2
	15	326° 11'.2	28° 04'.6	06'.3	134° 22'.4	42'.3	218° 46'.8	35'.8	97° 36'.7	45'.3
	16	341° 13'.7	43° 08'.3	05'.8	149° 23'.8	42'.7	233° 49'.6	35'.9	112° 38'.9	45'.3
	17	356° 16'.2	58° 12'.0	05'.4	164° 25'.3	43'.1	248° 52'.4	35'.9	127° 41'.2	45'.4
	18	11° 18'.6	73° 15'.7	04'.9	179° 26'.7	43'.5	263° 55'.3	35'.9	142° 43'.4	45'.5
	19	26° 21'.1	88° 19'.4	04'.5	194° 28'.1	43'.9	278° 58'.1	36'.0	157° 45'.6	45'.5
	20	41° 23'.5	103° 23'.2	04'.1	209° 29'.6	44'.3	294° 00'.9	36'.0	172° 47'.9	45'.6
	21	56° 26'.0	118° 26'.9	03'.6	224° 31'.0	44'.7	309° 03'.7	36'.1	187° 50'.1	45'.6
	22	71° 28'.5	133° 30'.6	03'.2	239° 32'.4	45'.1	324° 06'.6	36'.1	202° 52'.4	45'.7
	23	86° 30'.9	148° 34'.3	02'.8	254° 33'.9	45'.5	339° 09'.4	36'.2	217° 54'.6	45'.7
		M.P. 17:19	v 3'.6	d 0'.5	v 1'.4	d 0'.4	v 2'.8	d 0'.0	v 2'.2	d 0'.1

STARS			SUN		MOON				
Name	SHA	Dec	GHA	Dec	GHA	v	Dec	d	HP
Acamar	315° 17'.8	40° 15'.2 S	179° 24'.6	23° 10'.0 S	216° 15'.8	5'.1	18° 34'.1 S	3'.9	60'.1
Achernar	335° 26'.4	57° 10'.2 S	194° 24'.3	09'.8	230° 39'.9	5'.1	38'.0	3'.7	60'.2
Acrux	173° 08'.7	63° 10'.3 S	209° 24'.0	09'.7	245° 04'.0	4'.9	41'.7	3'.6	
Adhara	255° 11'.8	28° 59'.7 S	224° 23'.7	09'.5	259° 27'.9	4'.9	45'.3	3'.5	
Aldebaran	290° 48'.6	16° 32'.1 N	239° 23'.4	09'.3	273° 51'.8	4'.8	48'.8	3'.4	60'.3
			254° 23'.1	09'.2	288° 15'.6	4'.7	52'.2	3'.2	
Alioth	166° 20'.5	55° 52'.7 N	269° 22'.8	09'.0	302° 39'.3	4'.7	55'.4	3'.1	
Alkaid	152° 58'.8	49° 14'.4 N	284° 22'.5	08'.8	317° 03'.0	4'.6	58'.5	3'.0	60'.4
Alnair	27° 43'.6	46° 53'.7 S	299° 22'.2	08'.7	331° 26'.6	4'.5	19° 01'.5 S	2'.9	
Alnilam	275° 45'.6	1° 11'.8 S	314° 21'.9	08'.5	345° 50'.1	4'.5	04'.4	2'.7	
Alphard	217° 55'.4	8° 43'.3 S	329° 21'.6	08'.3	0° 13'.6	4'.4	07'.1	2'.5	60'.5
			344° 21'.3	08'.2	14° 37'.0	4'.4	09'.6	2'.5	
Alphecca	126° 11'.0	26° 40'.0 N	359° 21'.0	23° 08'.0 S	29° 00'.4	4'.2	19° 12'.1 S	2'.3	60'.5
Alpheratz	357° 43'.1	29° 10'.3 N	14° 20'.7	07'.8	43° 23'.6	4'.3	14'.4	2'.2	
Altair	62° 08'.2	8° 54'.5 N	29° 20'.4	07'.6	57° 46'.9	4'.1	16'.6	2'.0	60'.6
Ankaa	353° 15'.4	42° 14'.0 S	44° 20'.1	07'.5	72° 10'.0	4'.1	18'.6	1'.9	
Antares	112° 26'.1	26° 27'.6 S	59° 19'.8	07'.3	86° 33'.1	4'.1	20'.5	1'.7	
			74° 19'.5	07'.1	100° 56'.2	4'.0	22'.2	1'.7	60'.7
Arcturus	145° 55'.5	19° 06'.5 N	89° 19'.2	06'.9	115° 19'.2	4'.0	23'.9	1'.4	
Atria	107° 28'.0	69° 02'.8 S	104° 18'.9	06'.8	129° 42'.2	3'.9	25'.3	1'.4	
Avior	234° 17'.2	59° 33'.3 S	119° 18'.6	06'.6	144° 05'.1	3'.8	26'.7	1'.2	
Bellatrix	278° 31'.3	6° 21'.5 N	134° 18'.3	06'.4	158° 27'.9	3'.8	27'.9	1'.0	60'.8
Betelgeuse	271° 00'.5	7° 24'.4 N	149° 18'.0	06'.2	172° 50'.7	3'.8	28'.9	0'.9	
			164° 17'.7	06'.0	187° 13'.5	3'.7	29'.8	0'.8	
Canopus	263° 55'.4	52° 42'.4 S	179° 17'.4	23° 05'.9 S	201° 36'.2	3'.7	19° 30'.6 S	0'.6	60'.8
Capella	280° 33'.4	46° 00'.6 N	194° 17'.1	05'.7	215° 58'.9	3'.7	31'.2	0'.5	60'.9
Deneb	49° 31'.6	45° 20'.1 N	209° 16'.8	05'.5	230° 21'.6	3'.6	31'.7	0'.3	
Denebola	182° 33'.2	14° 29'.4 N	224° 16'.5	05'.3	244° 44'.2	3'.5	32'.0	0'.2	
Diphda	348° 55'.5	17° 54'.7 S	239° 16'.2	05'.1	259° 06'.7	3'.6	32'.2	0'.0	
			254° 15'.9	05'.0	273° 29'.3	3'.5	32'.2	0'.1	61'.0
Dubhe	193° 51'.1	61° 40'.1 N	269° 15'.6	04'.8	287° 51'.8	3'.5	32'.1	0'.2	
Elnath	278° 11'.7	28° 37'.0 N	284° 15'.3	04'.6	302° 14'.3	3'.4	31'.9	0'.4	
Eltanin	90° 46'.5	51° 29'.3 N	299° 15'.0	04'.4	316° 36'.7	3'.5	31'.5	0'.6	
Enif	33° 47'.0	9° 56'.5 N	314° 14'.7	04'.2	330° 59'.2	3'.4	30'.9	0'.7	61'.1
Fomalhaut	15° 23'.8	29° 32'.9 S	329° 14'.4	04'.0	345° 21'.6	3'.4	30'.2	0'.8	
			344° 14'.1	03'.8	359° 44'.0	3'.3	29'.4	1'.0	
Gacrux	172° 00'.3	57° 11'.3 S	359° 13'.8	23° 03'.6 S	14° 06'.3	3'.4	19° 28'.4 S	1'.1	61'.1
Gienah	175° 51'.8	17° 37'.2 S	14° 13'.5	03'.4	28° 28'.7	3'.3	27'.3	1'.3	
Hadar	148° 47'.5	60° 26'.1 S	29° 13'.2	03'.3	42° 51'.0	3'.3	26'.0	1'.4	61'.2
Hamal	328° 00'.1	23° 31'.8 N	44° 12'.9	03'.1	57° 13'.3	3'.3	24'.6	1'.6	
Kaus Aust.	83° 43'.7	34° 22'.5 S	59° 12'.6	02'.9	71° 35'.6	3'.3	23'.0	1'.7	
			74° 12'.3	02'.7	85° 57'.9	3'.3	21'.3	1'.9	
Kochab	137° 20'.9	74° 05'.7 N	89° 12'.0	02'.5	100° 20'.2	3'.3	19'.4	2'.0	
Markab	13° 38'.1	15° 17'.0 N	104° 11'.7	02'.3	114° 42'.5	3'.2	17'.4	2'.2	
Menkar	314° 14'.4	4° 08'.6 N	119° 11'.4	02'.1	129° 04'.7	3'.3	15'.2	2'.3	
Menkent	148° 07'.2	36° 26'.1 S	134° 11'.1	01'.9	143° 27'.0	3'.3	12'.9	2'.4	61'.3
Miaplacidus	221° 38'.7	69° 46'.4 S	149° 10'.8	01'.7	157° 49'.3	3'.3	10'.5	2'.6	
			164° 10'.5	01'.5	172° 11'.6	3'.2	07'.9	2'.8	
Mirfak	308° 39'.4	49° 54'.7 N	179° 10'.2	23° 01'.3 S	186° 33'.8	3'.3	19° 05'.1 S	2'.9	61'.3
Nunki	75° 58'.2	26° 16'.6 S	194° 09'.9	01'.1	200° 56'.1	3'.3	02'.2	3'.0	
Peacock	53° 19'.2	56° 41'.3 S	209° 09'.6	00'.9	215° 18'.4	3'.3	18° 59'.2 S	3'.2	
Polaris	317° 17'.9	89° 19'.7 N	224° 09'.3	00'.7	229° 40'.7	3'.3	56'.0	3'.3	
Pollux	243° 26'.9	27° 59'.3 N	239° 09'.0	00'.5	244° 03'.0	3'.4	52'.7	3'.5	
			254° 08'.8	00'.3	258° 25'.4	3'.3	49'.2	3'.6	61'.4
Procyon	244° 59'.0	5° 11'.1 N	269° 08'.5	00'.1	272° 47'.7	3'.4	45'.6	3'.8	
Rasalhague	96° 06'.4	12° 33'.1 N	284° 08'.2	22° 59'.9 S	287° 10'.1	3'.4	41'.8	3'.9	
Regulus	207° 42'.9	11° 53'.7 N	299° 07'.9	59'.7	301° 32'.5	3'.4	37'.9	4'.0	
Rigel	281° 11'.4	8° 11'.3 S	314° 07'.6	59'.5	315° 54'.9	3'.4	33'.9	4'.2	
Rigil Kent	139° 51'.4	60° 53'.2 S	329° 07'.3	59'.2	330° 17'.3	3'.4	29'.7	4'.4	
			344° 07'.0	59'.0	344° 39'.7	3'.5	25'.3	4'.4	
Sabik	102° 12'.4	15° 44'.3 S	359° 06'.7	22° 58'.8 S	359° 02'.2	3'.5	18° 20'.9 S	4'.6	61'.4
Schedar	349° 40'.0	56° 37'.2 N	14° 06'.4	58'.6	13° 24'.7	3'.5	16'.3	4'.8	
Shaula	96° 21'.8	37° 06'.6 S	29° 06'.1	58'.4	27° 47'.2	3'.6	11'.5	4'.9	
Sirius	258° 33'.0	16° 44'.3 S	44° 05'.8	58'.2	42° 09'.8	3'.6	06'.6	5'.0	
Spica	158° 30'.9	11° 14'.0 S	59° 05'.5	58'.0	56° 32'.4	3'.6	01'.6	5'.2	
			74° 05'.2	57'.8	70° 55'.0	3'.7	17° 56'.4 S	5'.2	
Suhail	222° 51'.7	43° 29'.4 S	89° 04'.9	57'.6	85° 17'.7	3'.7	51'.2	5'.5	
Vega	80° 39'.1	38° 48'.0 N	104° 04'.6	57'.3	99° 40'.4	3'.7	45'.7	5'.5	
Zuben'ubi	137° 05'.2	16° 05'.9 S	119° 04'.3	57'.1	114° 03'.1	3'.8	40'.2	5'.7	
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Venus	61° 08'.3	13:14	164° 03'.4	56'.5	157° 11'.6	3'.9	22'.7	6'.1	
Mars	168° 51'.5	06:06							
Jupiter	252° 21'.5	00:32							
Saturn	131° 34'.4	08:34	SD 16'.3	d 0'.2	SD 16'.5		16'.7	16'.7	

Lat	Twilight Nautical	Twilight Civil	Sunrise	Moonrise 30	Moonrise 31	Moonrise 1
N 72°	08:25	10:45	-	-	-	-
N 70°	08:06	09:51	-	08:50	10:16	10:32
68°	07:50	09:18	-	07:52	09:06	09:46
66°	07:38	08:54	10:29	07:18	08:29	09:15
64°	07:27	08:35	09:50	06:53	08:03	08:53
62°	07:18	08:19	09:23	06:34	07:42	08:34
60°	07:09	08:06	09:03	06:18	07:26	08:19
N 58°	07:02	07:54	08:46	06:04	07:12	08:06
56°	06:56	07:44	08:31	05:53	06:59	07:55
54°	06:50	07:36	08:19	05:43	06:49	07:45
52°	06:44	07:28	08:08	05:34	06:40	07:37
50°	06:39	07:20	07:59	05:25	06:31	07:29
45°	06:27	07:05	07:38	05:08	06:13	07:12
N 40°	06:17	06:51	07:22	04:54	05:59	06:58
35°	06:08	06:40	07:08	04:42	05:46	06:47
30°	06:00	06:29	06:56	04:32	05:36	06:36
20°	05:43	06:11	06:35	04:14	05:17	06:19
N 10°	05:27	05:54	06:17	03:59	05:01	06:03
0°	05:11	05:37	05:59	03:45	04:46	05:49
S 10°	04:52	05:19	05:42	03:30	04:31	05:35
20°	04:30	04:59	05:23	03:15	04:15	05:19
30°	04:01	04:34	05:02	02:58	03:57	05:02
35°	03:43	04:19	04:49	02:48	03:46	04:52
40°	03:20	04:01	04:34	02:36	03:34	04:40
45°	02:50	03:39	04:16	02:22	03:20	04:26
S 50°	02:06	03:10	03:54	02:06	03:02	04:09
52°	01:39	02:55	03:44	01:58	02:54	04:01
54°	00:58	02:38	03:31	01:50	02:45	03:53
56°	-	02:16	03:18	01:40	02:35	03:43
58°	-	01:48	03:01	01:29	02:23	03:31
S 60°	-	01:03	02:41	01:17	02:09	03:18
S 62°	-	-	02:16	01:02	01:53	03:03

Lat	Sunset	Twilight Civil	Twilight Nautical	Moonset 30	Moonset 31	Moonset 1
N 72°	-	13:21	15:42	-	-	-
N 70°	-	14:16	16:01	11:04	11:48	13:44
68°	-	14:49	16:16	12:02	12:58	14:30
66°	13:37	15:13	16:29	12:36	13:35	14:59
64°	14:16	15:32	16:40	13:01	14:01	15:22
62°	14:43	15:47	16:49	13:21	14:21	15:40
60°	15:04	16:01	16:57	13:37	14:38	15:54
N 58°	15:21	16:12	17:04	13:51	14:52	16:07
56°	15:35	16:22	17:11	14:03	15:04	16:18
54°	15:47	16:31	17:17	14:13	15:14	16:27
52°	15:58	16:39	17:22	14:22	15:24	16:36
50°	16:08	16:46	17:27	14:30	15:32	16:43
45°	16:28	17:02	17:39	14:48	15:50	17:00
N 40°	16:45	17:15	17:49	15:02	16:04	17:13
35°	16:58	17:27	17:58	15:14	16:16	17:24
30°	17:11	17:37	18:07	15:25	16:27	17:34
20°	17:31	17:55	18:23	15:43	16:45	17:51
N 10°	17:50	18:12	18:39	15:59	17:01	18:05
0°	18:07	18:29	18:55	16:14	17:16	18:19
S 10°	18:24	18:47	19:14	16:28	17:31	18:32
20°	18:43	19:07	19:36	16:44	17:47	18:47
30°	19:04	19:32	20:05	17:02	18:05	19:03
35°	19:17	19:47	20:23	17:13	18:15	19:13
40°	19:32	20:05	20:46	17:25	18:27	19:23
45°	19:50	20:27	21:16	17:39	18:41	19:36
S 50°	20:12	20:56	22:00	17:57	18:58	19:52
52°	20:22	21:10	22:26	18:05	19:07	19:59
54°	20:34	21:28	23:06	18:14	19:16	20:07
56°	20:48	21:49	-	18:24	19:26	20:15
58°	21:04	22:17	-	18:36	19:37	20:25
S 60°	21:24	23:01	-	18:49	19:50	20:37
S 62°	21:49	-	-	19:06	20:06	20:50

Day	SUN Eqn. of Time 00h	SUN Eqn. of Time 12h	SUN Mer. Pass.	MOON Mer. Pass. Upper	MOON Mer. Pass. Lower	MOON Age/ Vis
30	2 21	2 35	12:03	09:59	22:30	27d 6%
31	2 50	3 04	12:03	11:01	23:33	28d 2%
1	3 18	3 33	12:04	12:04	24:35	0d 0%

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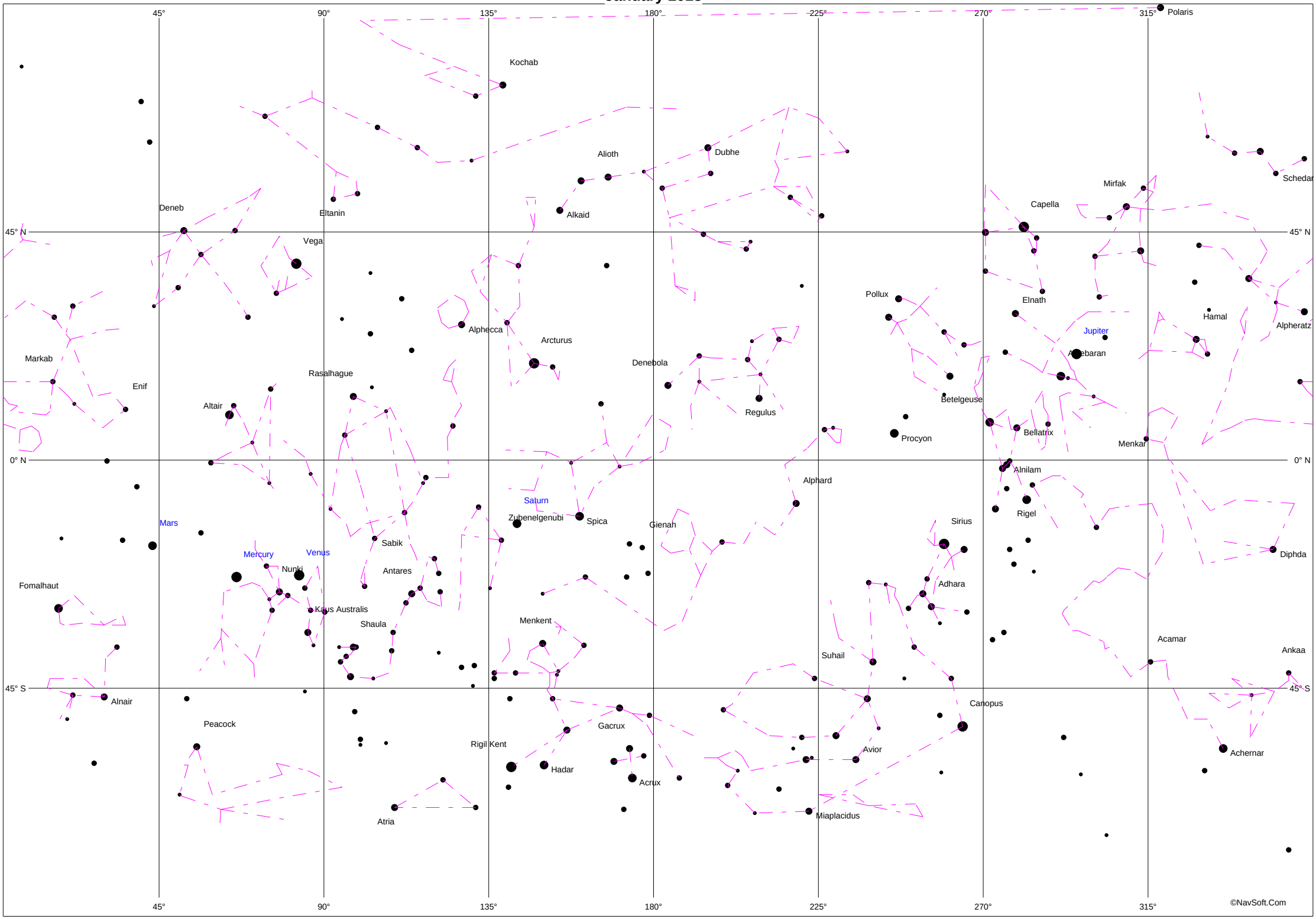
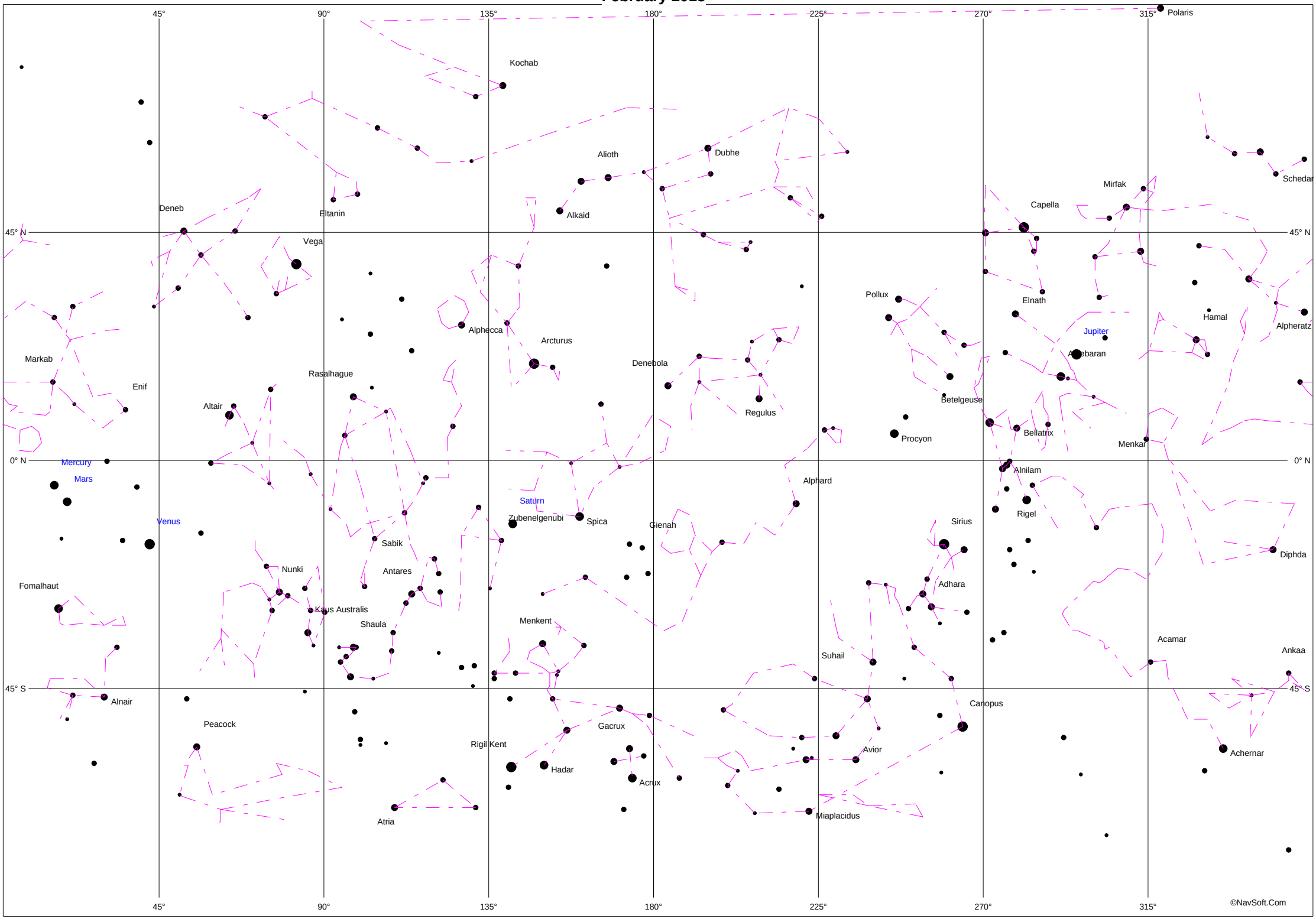
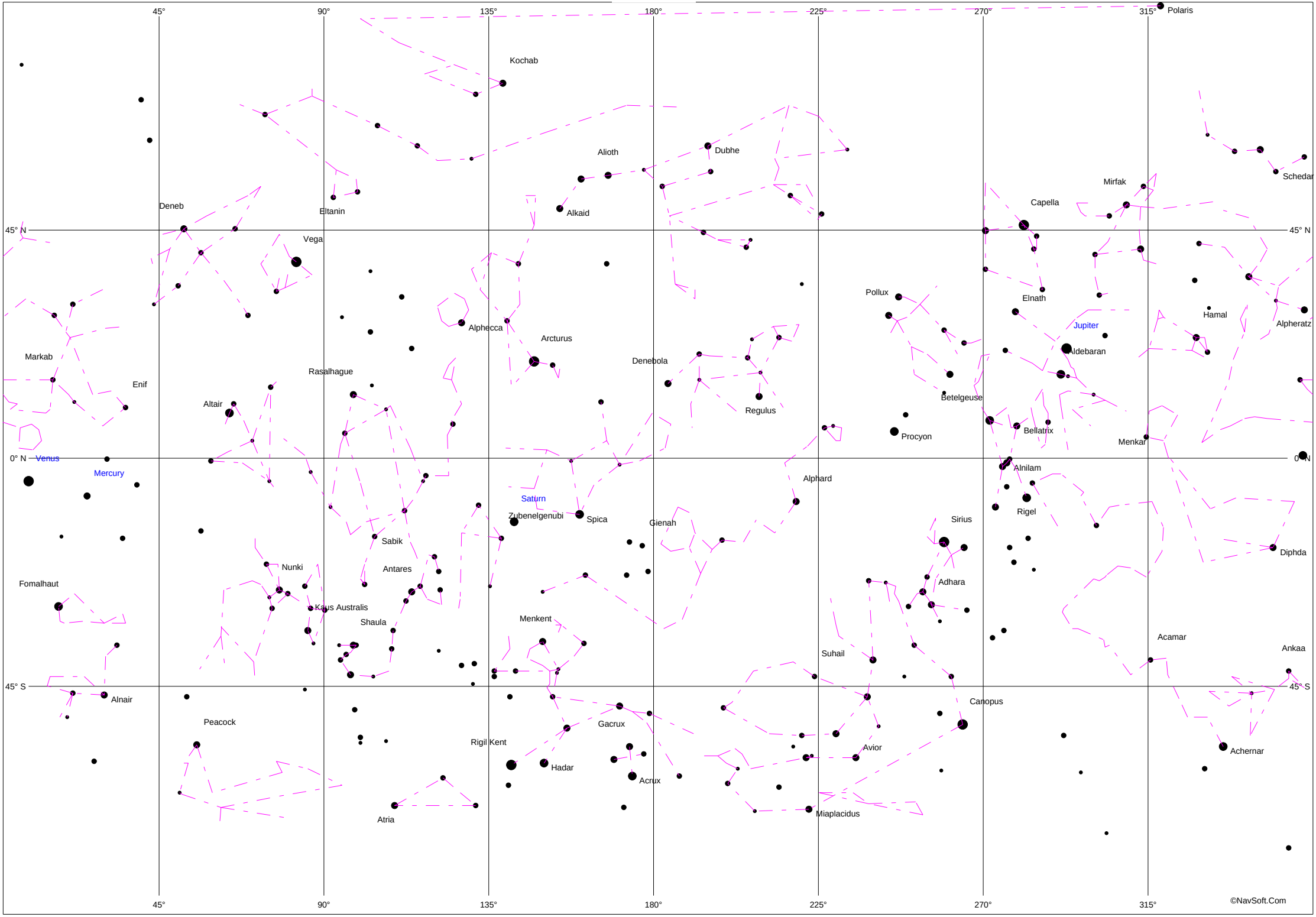
January 2013



February 2013



March 2013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Dubhe
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Eltanin
Alkaid
45° N
Vega
Pollux
Elnath
Hamal
Alpheratz
Jupiter
Alphecca
Arcturus
Aldebaran
Markab
Denebola
Rasalhague
Enif
Betelgeuse
Altair
Regulus
Procyon
Bellatrix
Menkar
0° N
Venus
Mercury
Alnilam
Alphard
Saturn
Rigel
Zubenelgenubi
Spica
Gienah
Sirius
Sabik
Diphda
Nunki
Antares
Fomalhaut
Adhara
Kaus Australis
Shaula
Menkent
Acamar
Ankaa
Suhail
45° S
Alnair
Canopus
Peacock
Gacrux
Rigil Kent
Avior
Achernar
Hadar
Acrux
Atria
Miaplacidus
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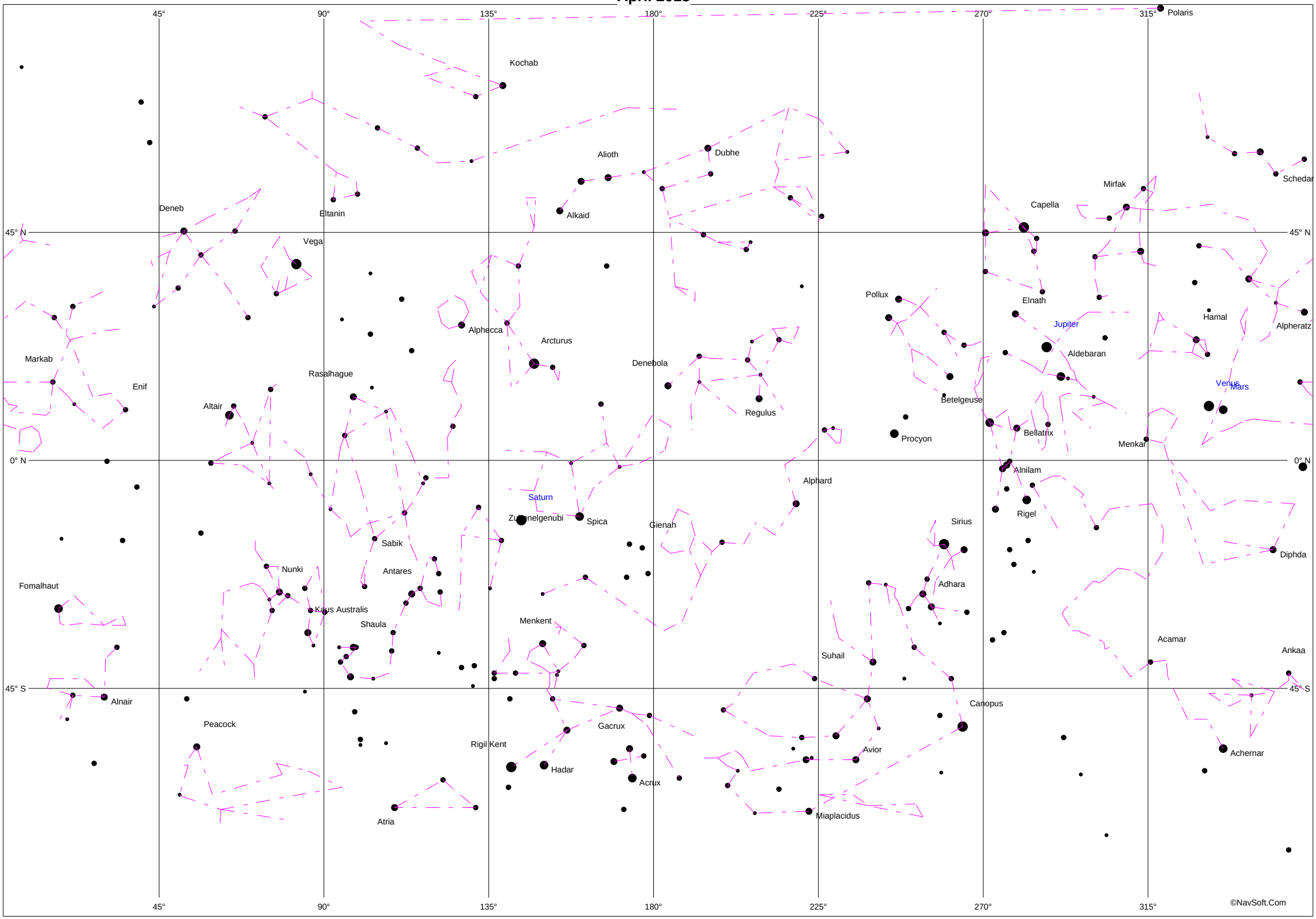
April 2013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Hamal
Alpheratz
Jupiter
Alphecca
Arcturus
Aldebaran
Markab
Denebola
Rasalhague
Enif
Venus
Mars
Betelgeuse
Altair
Regulus
Procyon
Bellatrix
Menkar
0° N
Alnilam
Alphard
Saturn
Rigel
Zubenelgenubi
Spica
Gienah
Sirius
Sabik
Diphda
Nunki
Antares
Fomalhaut
Adhara
Kaus Australis
Shaula
Menkent
Acamar
Suhail
Ankaa
45° S
Alnair
Canopus
Peacock
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Rigil Kent
Avior
Achernar
Hadar
Acrux
Atria
Miaplacidus
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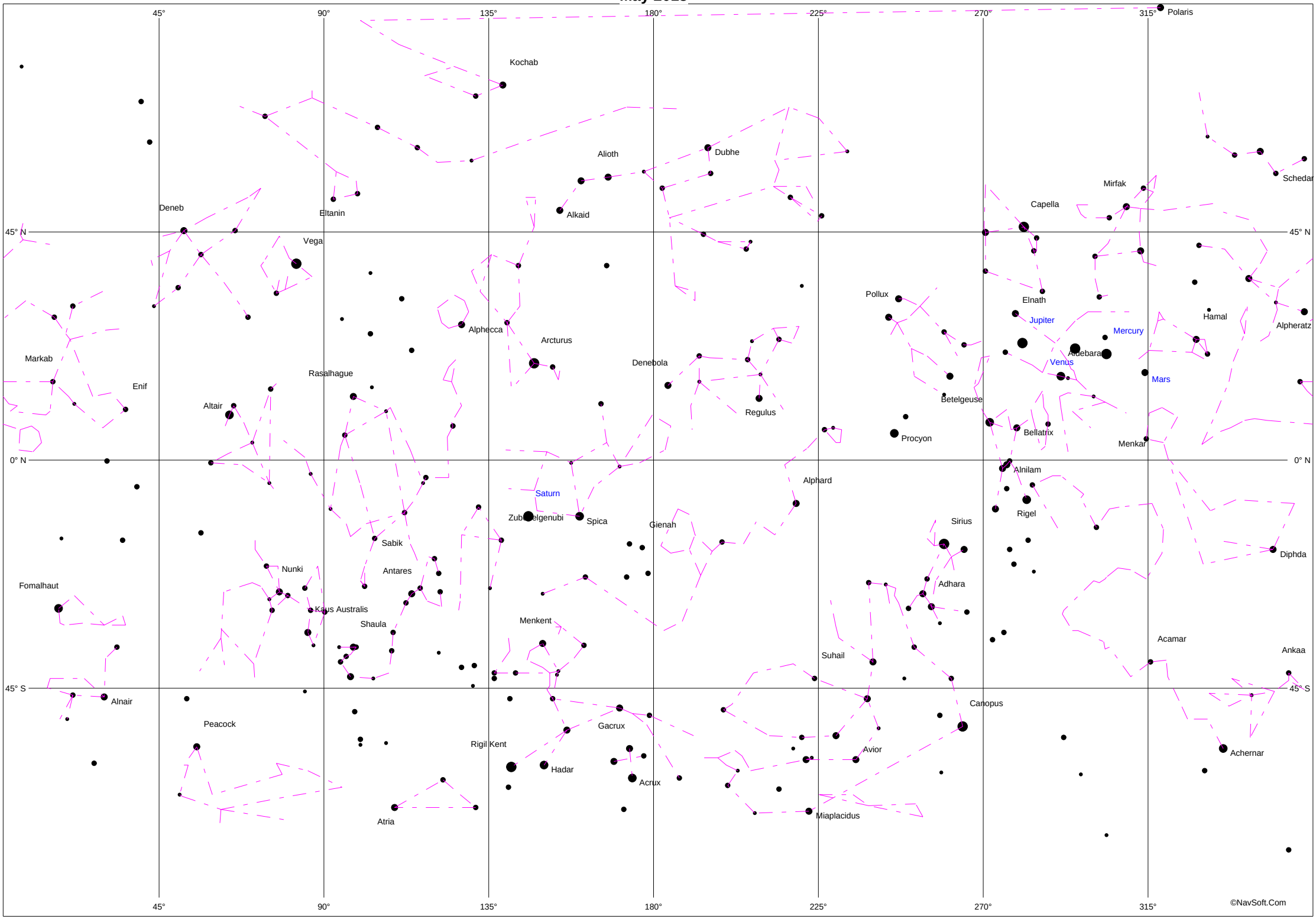
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Pollux
Elnath
Jupiter
Hamal
Alpheratz
Mercury
Alphecca
Arcturus
Aldebaran
Markab
Denebola
Venus
Rasalhague
Mars
Enif
Betelgeuse
Altair
Regulus
Bellatrix
Procyon
Menkar
0° N
Alnilam
Alphard
Saturn
Rigel
Zubenelgenubi
Spica
Gienah
Sirius
Sabik
Diphda
Nunki
Antares
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Adhara
Kaus Australis
Shaula
Menkent
Acamar
Ankaa
Suhail
45° S
Alnair
Canopus
Peacock
Gacrux
Rigil Kent
Avior
Achernar
Hadar
Acrux
Atria
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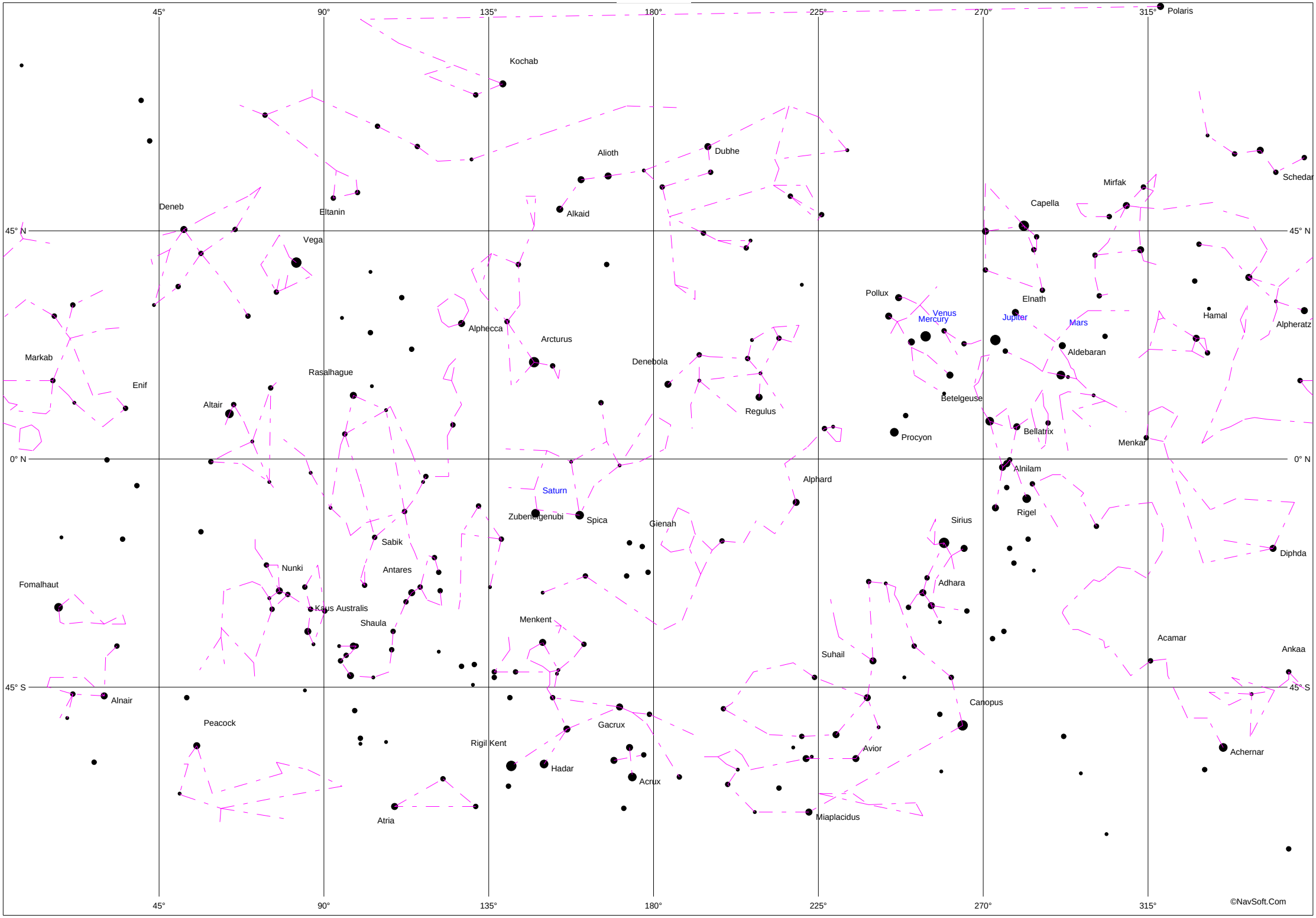
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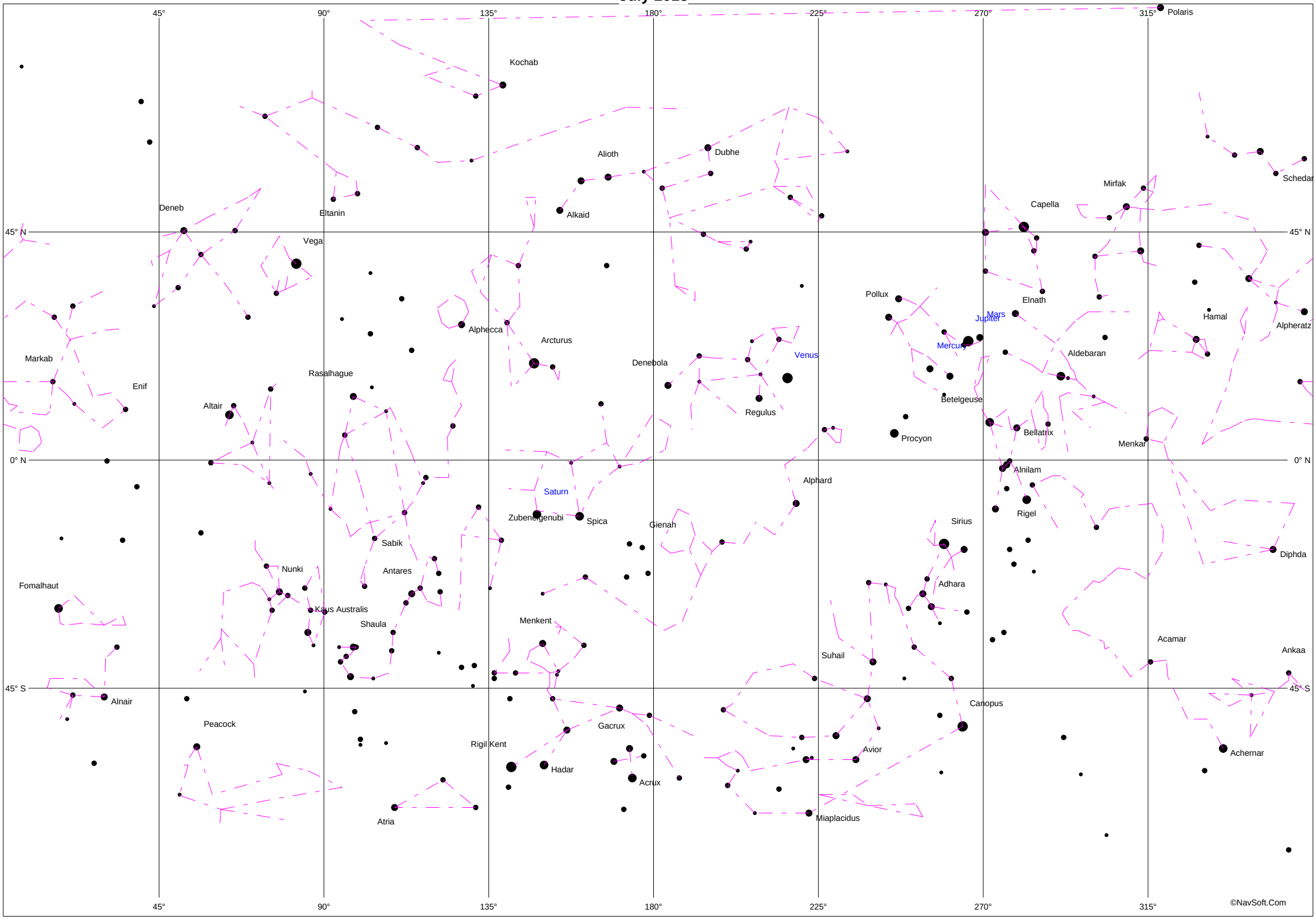
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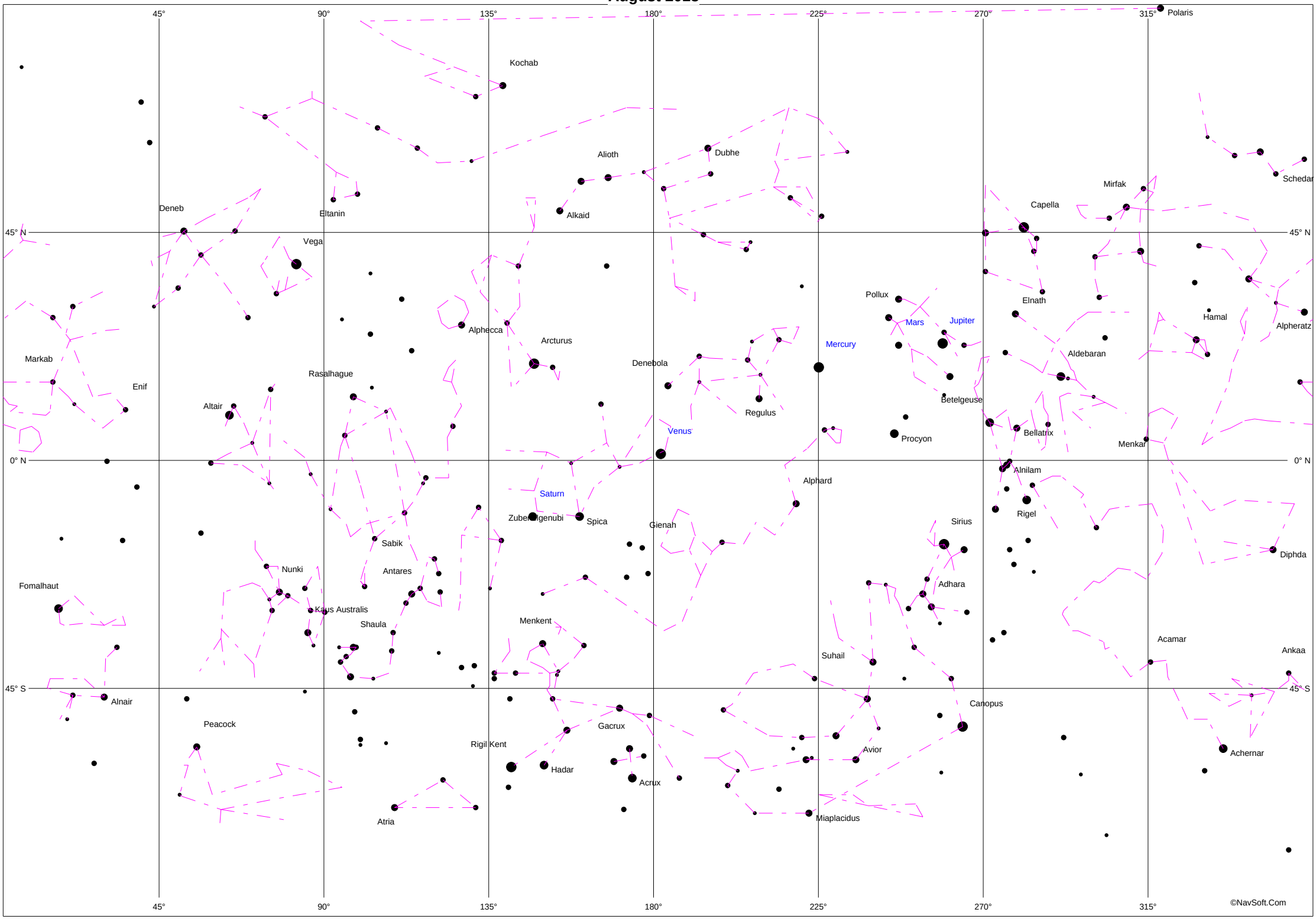
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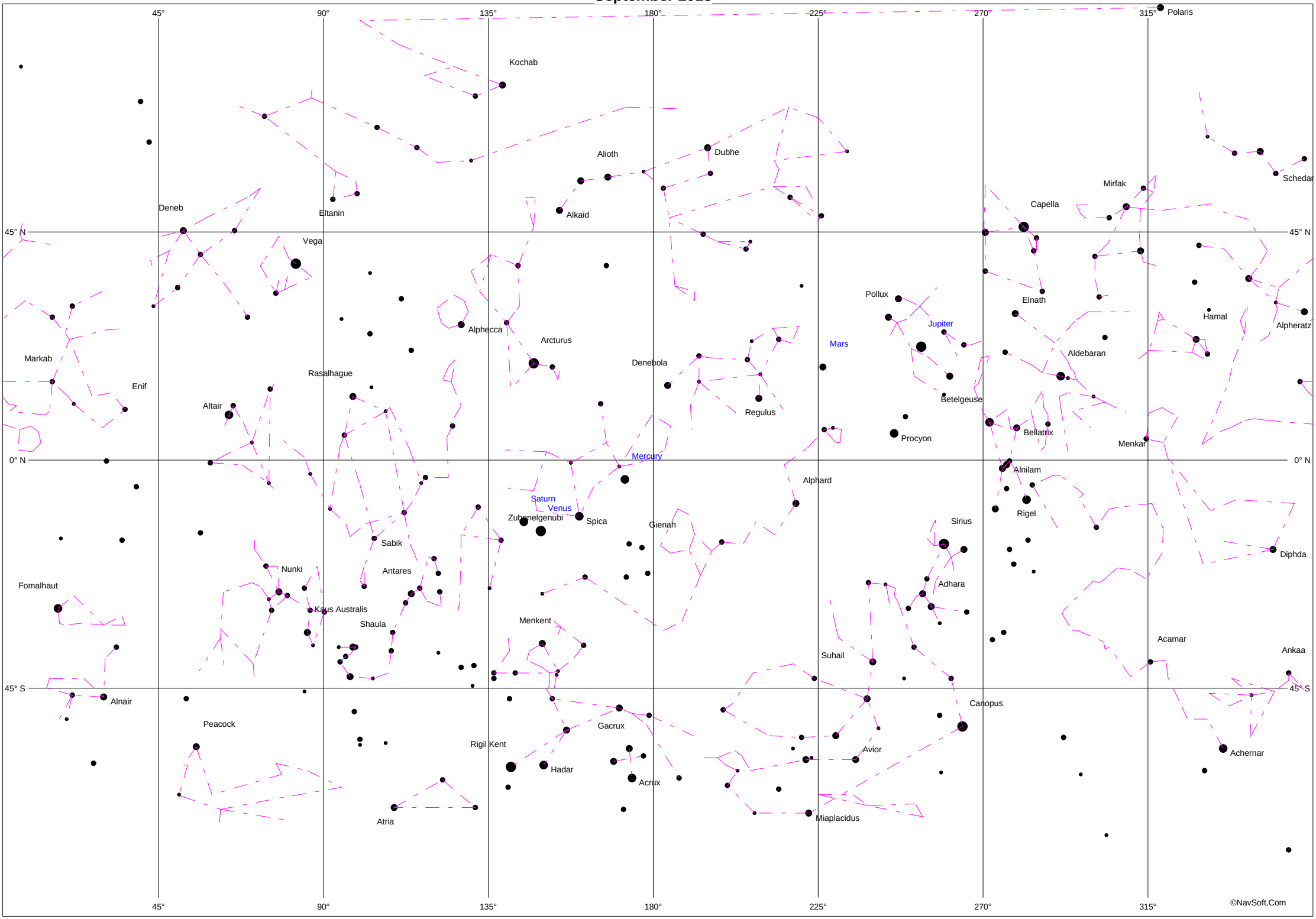

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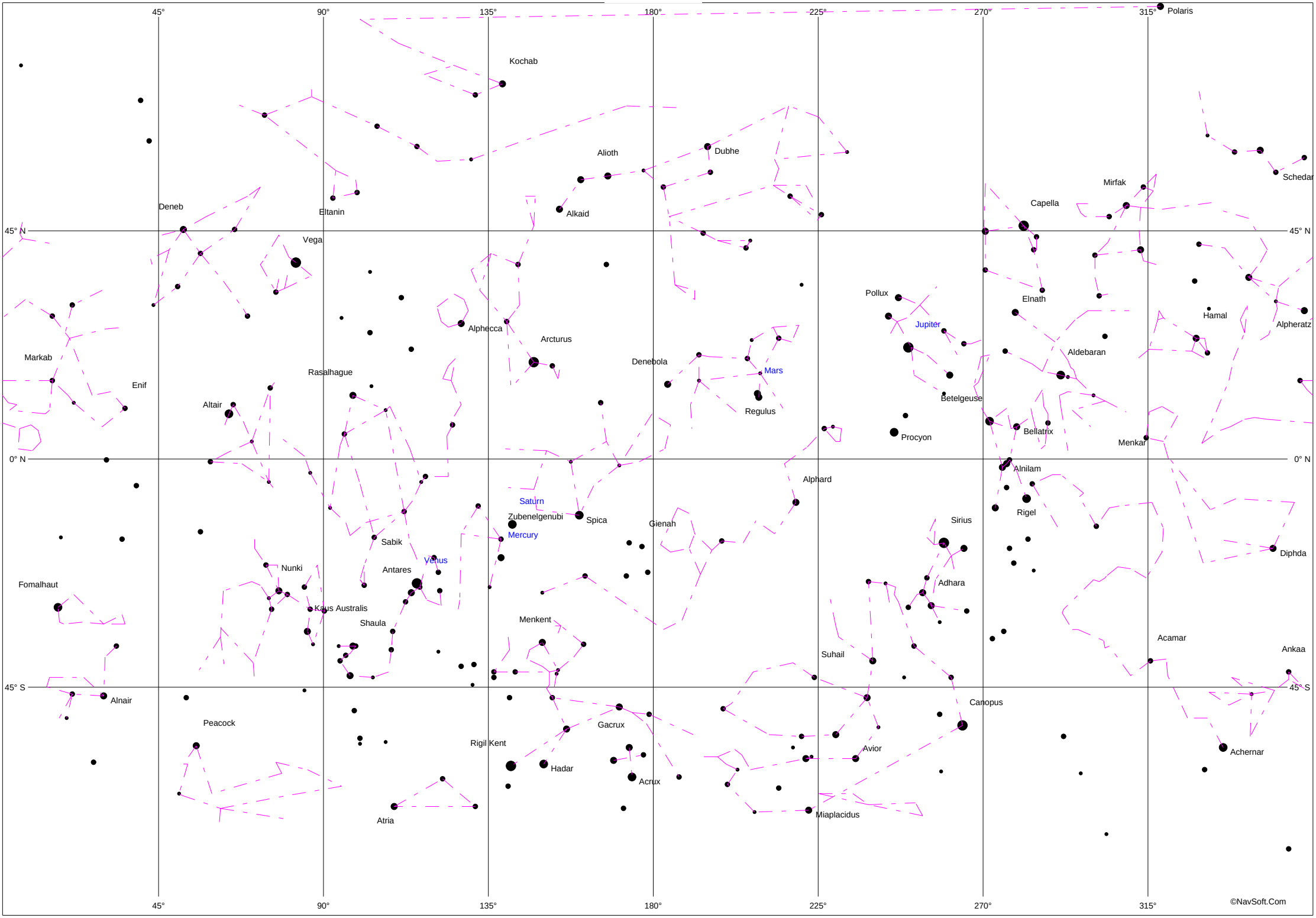

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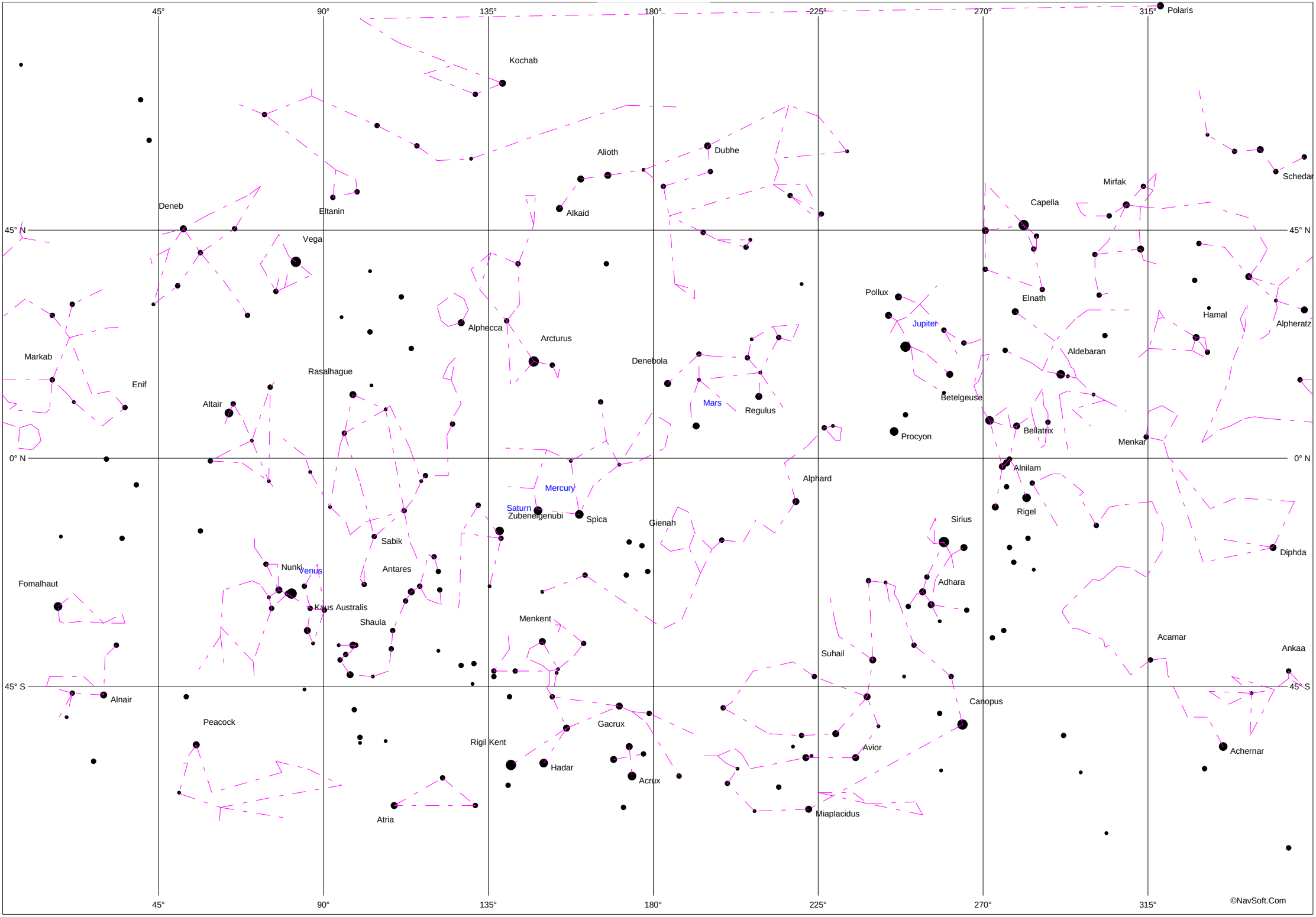
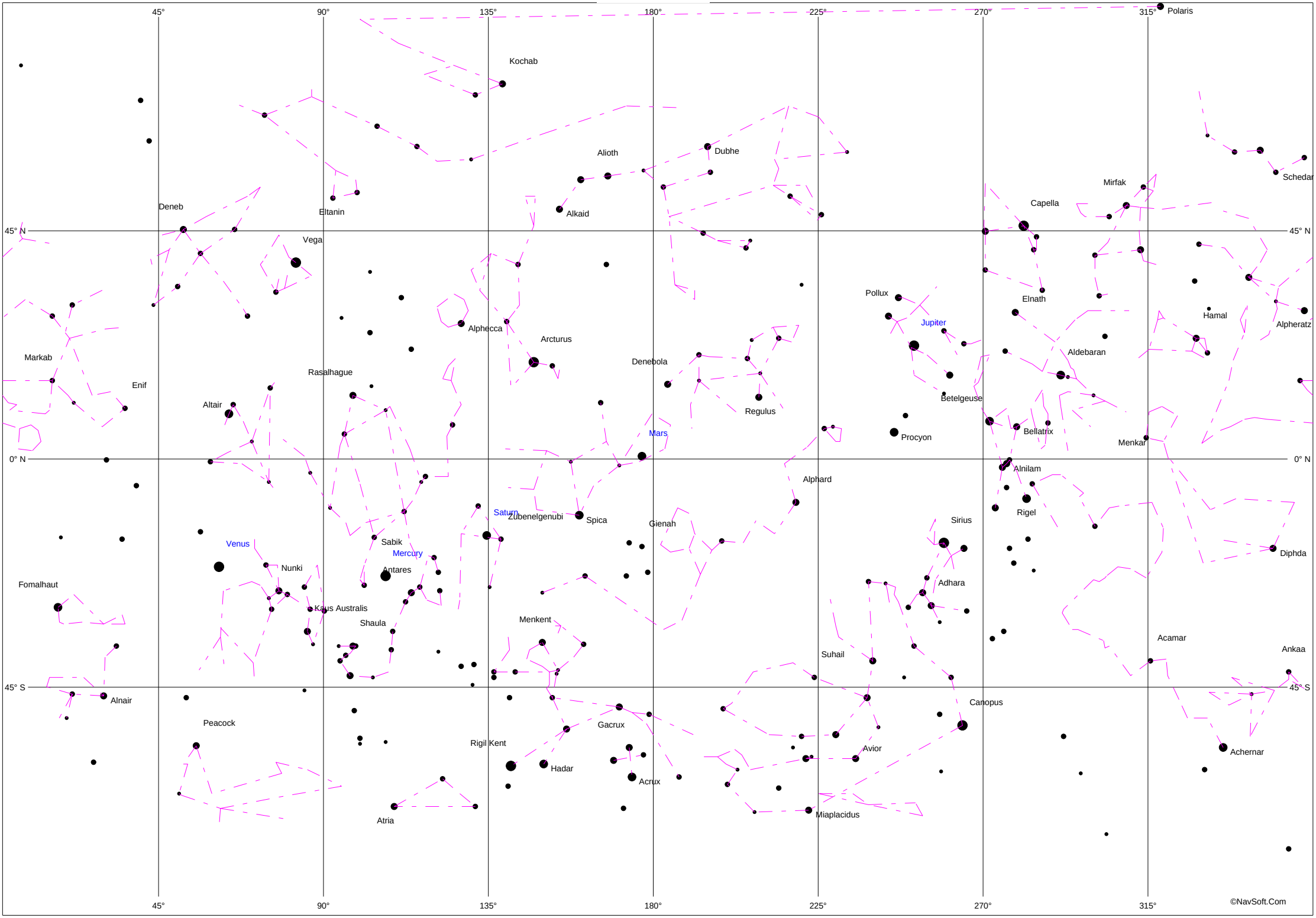
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